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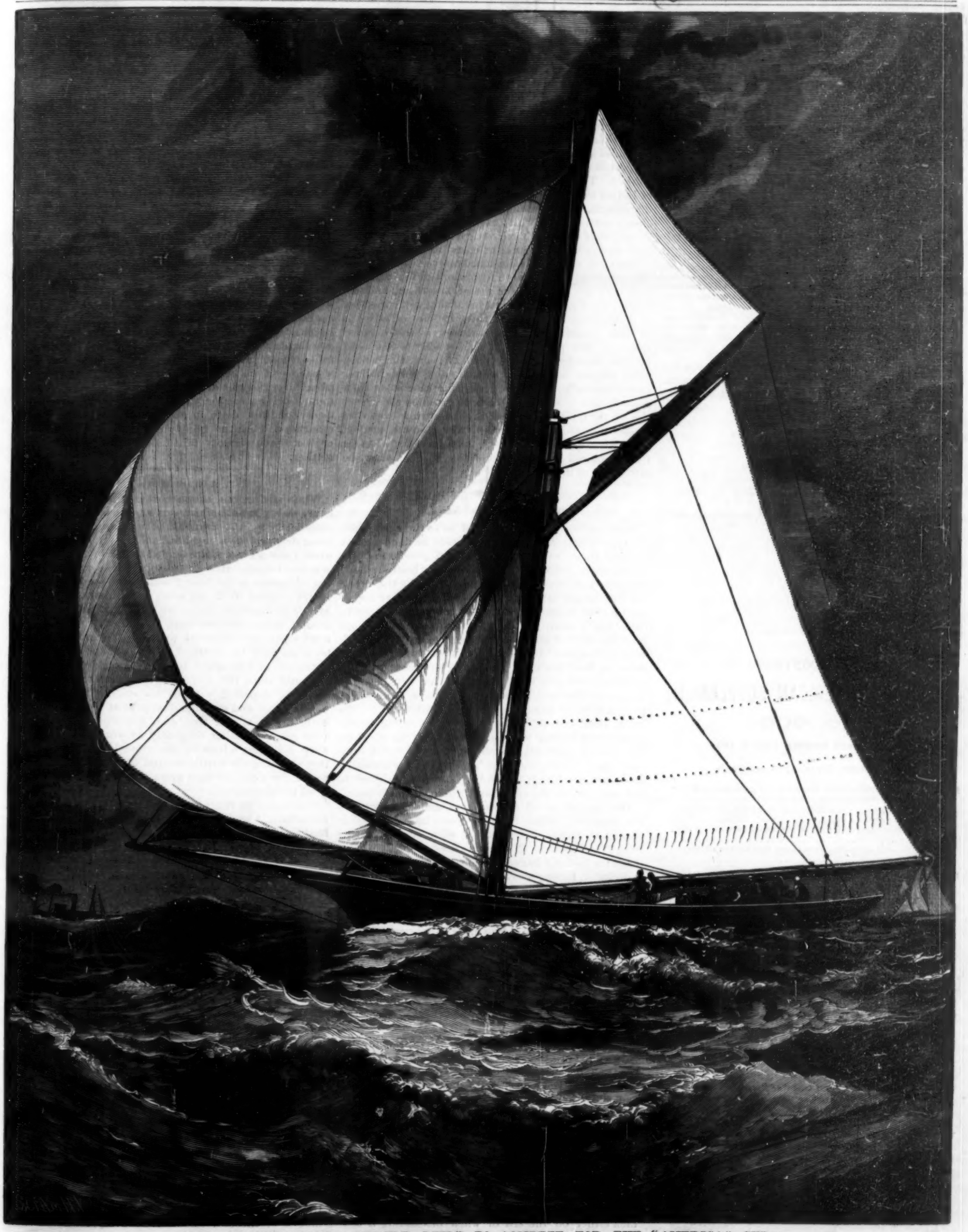

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NEW YORK, SATURDAY, JULY 2, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 600.

For the Week Ending July 2, 1887.

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CORSETS AND CONSUMPTION.

The mechanism of breathing may be effected by two separate and distinct sorts of nerves and muscles. The upper portion of the body, including the ribs and thorax generally, may expand, and thereby draw air into the lungs. This is termed costal breathing, literally rib breathing. On the other hand, the muscles of the abdomen may come into play, and by depressing the diaphragm, may thus increase the chest cavity. In this type, termed abdominal or diaphragmatic breathing, the muscles of the upper part of the body remain inactive. Boerhaave, in 1744, observed a radical difference in male and female breathing. The masculine type is abdominal, the female is costal. On these premises Dr. Thomas J. Mays, of Philadelphia, has based an interesting investigation. It appears highly probable that the reason of the costal breathing of women is that they compress the diaphragmatic region with corsets, so as to suppress all but costal breathing, and so as to develop the latter highly. Dr. Mays subjected a number of Indian women to examination. He used a modification of Paul Bert's pneumograph. By this apparatus a trace indicative of the extent of chest and of abdominal movement was produced so as to show in graphic form the relative proportions of the two types of breathing in the same subject. The result was that he found the majority of Indian women to breathe almost entirely with the diaphragm. Their pneumograph tracings corresponded closely with those of white men. As the Indian women do not wear corsets, this investigation tended to prove that corsets were the cause of costal breathing.

The most curious conclusion, however, is the possible influence of corsets on consumption. Admitting that they are the cause of costal breathing, and accepting the theory that costal breathing is a corrective of consumption, a plea for these articles of attire is at once established as preventives of the dreaded malady. The possibility of this benefit is increased by the consideration that men are, on the whole, more subject to it than women, and that Indians seem peculiarly its subjects. Yet the case is far from proved, and it would be rash to consider the corset side of the question as proved. Admitting even that corsets diminish consumption, the account against them, when used injudiciously, must be regarded as far from balanced by any good of this sort that may be attributed to them.

OUR SLOW NEW NAVY.

Naval authorities have differed as to the most efficient type of armored cruiser. One side inclines toward monster ships, with heavy sides and ponderous batteries, which, because of their necessarily limited speed, are little more than floating batteries, while the other has strenuously set forth the merits of light-armored, swift-footed commerce destroyers, carrying from one to three heavy guns. Up to quite a recent period, those favoring the first mentioned type were in the ascendency in England, or, if not the most numerous, possessed at least the most power; for as recently as last autumn, contracts were given out for two new big ships—the Nile and Trafalgar. Just now there seems to be a decided change of views on this subject; the naval staff and the military press protesting loudly against any further waste of money and time on ships that cannot overhaul a merchant steamer of even ordinary speed on the high seas, and when they approach the coast are likely, because of their sluggishness, to fall easy prey to the crafty and winged torpedo boat.

The English naval constructors, under direction of the Admiralty office, have for years been engaged in the construction of leviathans, with speeds varying from 12 to 16 knots. Now an earnest appeal is being made for fast and less costly constructions; the time, it is declared, having arrived when the younger blood of the navy should have something to say concerning the building of the fleet they will be called upon to command, and the aged warriors who still pin their faith to the old line-of-battle ship order of construction have exhausted the patience even of the most conservative.

Though the British naval constructors have for years furnished criteria for the rest of the world, there are those who, of late, have refused to follow them further to the lengths they would lead, though others, like the Italians, have outstripped them in a career of folly.

The defects of the heavy armored ship or floating battery have often been illustrated, and the point has been urged that a cruising ship, to be effective, should be at least as swift of foot as the merchantman she is looked to to capture or destroy. Our English contemporary, the *Broad Arrow*, in a recent article on this subject, argues the case from the same standpoint, and records a similar opinion as to the relative effectiveness of the two types. Referring to M. Gabriel Charmes' recently published essay on marine warfare, it quotes the following observation: "It is useless to continue the construction of armorclads, because they cannot be protected against torpedo attack either on the sea or when blockading a coast. Cruisers and fast gunboats should, however, be built, because the chief points of attack should be the commerce and unfortified towns of an enemy;" adding that though it does not regard this opinion as final, there is much truth in it. The construction of the Japanese light-armored cruiser Naniwah'kan, the Esmeralda for Chili, and a similar craft for Brazil, may be said to mark a distinct epoch and turning point in naval designing. In the performances of these craft is realized the hopes so often expressed by cool-headed naval authorities. With speeds nearly equal to the fastest merchant ships afloat, such craft, on occasion, might instantly become masters of the sea. Though pygmies when compared in armor and battery to the monster ships of the European powers, they would stand like giants in the path of commerce, having the power to catch and destroy, and yet to avoid capture themselves. They carry a fairish battery too; one of them, two ten inch and one eight inch gun *en barbette*, and another, two heavy guns in turret and a sweep of the circle.

When our new steel cruisers, the Dolphin, Atlanta, Boston, and Chicago, are compared with these admirable vessels, it is hard to understand how their designers could have made so fatal an error. Here we have four slow and unarmored ships, or, in other words, ships that can neither fight nor run away. Take the Chicago, the largest, and designed to be the fastest of the four. On her way from Chester, last week, she did not make quite 13 knots, though her engines had been working at the dock for several weeks. Of course, she will do better when these engines are worn smooth by attrition, but it is not likely she will do very much more than this, and even supposing she eventually logs "15 knots at sea," as is laid down in the contract, how could she hope to catch any of that great fleet of fast steamers that dot the seas? Like her sister ships, she is unarmored, for a skin of steel is no armor at all, and hence how could she defend herself with her eight inch guns against the armored modern ship with its powerful battery? So far as harbor defense is concerned, she would be of no value, because, if she cannot defend herself from assault on the high seas, she could not do so inclosed in a harbor. It seems evident that the designers of these craft, in attempting to get the good qualities of both the big fighting ship and the light cruiser, have signally failed because they have got neither.

A Wise Wasp.

While sitting, one summer day, at the side of the house on a platform which served as a piazza, but was roofed only by the branches of two large trees, something dropped upon my head and rolled into my lap, when I saw a large white bodied spider in the clutches of a small wasp. Hastily brushing these unceremonious visitors on to the floor, I watched to see if the wasp would succeed in flying away with his huge enemy. After a struggle the spider lay quiet, and the wasp ran around, seizing first one part, then another, but finally went away, as I supposed, for help. In about a quarter of an hour he returned, still alone, and began trying again, as I thought, to find some place by which he could seize the round body and carry it away. Again he departed without his spider. This time I watched him and saw him disappear at the edge of the lawn, under a pear tree, and, following, found him, after some searching, diligently at work with another wasp enlarging a hole in the ground, having already thrown out quite a little mound of earth. I was surprised, for I did not then know that any kind of wasp lived in the ground.

I returned to the piazza, and soon, when the wasp came back, I was convinced, by more careful watching, that he was measuring each part of the spider's body instead of trying to get hold of it. The antennæ seemed to be the organs mostly employed in this operation. When he went home again, I was before him, and saw him meet his co-worker, put his head close to his, and evidently informed him that the doorway was not yet big enough, for they fell busily at work enlarging it. Then more measuring, more digging, until, after three long hours, he returned, this time with his friend, and they carried away their prey and bestowed it in their underground home.

Question for studious Agassizites: How many kinds of wasps are there, and how many have adopted the metric system?—*The Owl.*

Distilling Turpentine.

A turpentine distillery was recently established at New Orleans, where a new process of distillation is followed, materially differing from that in use elsewhere. Under the new system, the pine wood is placed in iron retorts charged with superheated steam, and fired with wood from beneath. After six hours gas is evolved, and at the same time there begins to distill a mixture of crude turpentine and tar, from which the gas, being more volatile, separates. The liquid portion flows into a bath, from which it is pumped into the still. Here the crude turpentine is refined, and flows from the mouth of the still into barrels ready for shipment, while the tar is discharged from another opening.

PHOTOGRAPHIC NOTES.

Directions and Formulas for the Development of Dry Plates.—Mr. G. Cramer, of St. Louis, Mo., one of the pioneers in the manufacture of gelatino-bromide plates, has recently issued the following practical formulas and directions, which we quote in full:

Bear in mind that very rapid plates are sensitive to light of any color. The safest light is a combination of ruby and yellow, just strong enough to enable you to judge of intensity of negative and progress of development, and the plate should not be held close to the light for examination for more than a few seconds.

The following combinations make a safe light:

Orange colored paper with ruby glass.

Orange glass with cherry fabric.

Ruby glass with canary fabric.

Orange and ruby glass combined with ground glass.

Green is not as non-actinic as ruby and yellow combined, and it has furthermore the disadvantage that with it the intensity of negative cannot be judged as well as with the ruby light.

To make sure your light is safe, make the following test:

Cover one-half of a "lightning" plate with opaque paper and expose it to the light for about two minutes, at the distance generally observed while developing. Develop, and if the unprotected part of the plate shows fog, screen the light with additional paper or fabric until it is found perfectly safe.

For a developer of good keeping qualities, and which can be used repeatedly, prepare the following solutions:

No. 1. Alkaline Solution.

Water	60 ounces.
Sulphite of soda crystals	4 "

Four ounces sulphite of soda crystal are equal to about two ounces of sulphite granular. The crystals can be more easily obtained in sufficient purity than the granular, and are therefore preferred.

Yellow prussiate of potass	2 ounces.
Carbonate of soda crystals (sal soda)	1 ounce.

Put the ingredients into a wide mouth bottle, cork well, and let them dissolve. Keep also the sulphite of soda in well stoppered bottles, as contact with air will decompose the sulphite and render it worthless.

No. 2. Pyro Solution.

Distilled or ice water	6 ounces.
Sulphuric acid	10 minims.
Pyrogallic acid	1 ounce.

Do not prepare too large a quantity of the pyro solution, as it will in time become discolored and unfit for use.

No. 3. Bromide Solution.

Water	10 ounces.
Bromide of potassium	1 ounce.

DEVELOPER.

Sufficient quantity for half a day's work may be mixed at one time, in the following proportions:

To 8 ounces alkaline solution add from 2 to 4 drachms pyro solution.

Pour enough of this solution into a pouring bottle to well cover the plate, and add to this a few drops of bromide solution (say about 15 minims to 8 ounces developer), to prevent any slight haziness which is apt to be produced by fresh developer.

Several plates can be developed in succession in the same solution with good results. When it becomes exhausted and works too slow, pour it away, excepting about an ounce, which is to be added to eight ounces of new developer for the same purpose for which the bromide solution was used in the beginning. During cool weather an addition of bromide or old developer is not necessary, and the developer should be kept at about 70 degrees Fahrenheit.

Some emulsions require more pyro than others to obtain the proper amount of intensity. Three drachms will be found an average.

Do not use a stronger alkaline solution than given above, as a very sensitive plate will be injured by too powerful a developer.

If carbonate of potassium or dried carbonate of soda is used, note that one-half ounce of either is equal in strength to one ounce carbonate of soda crystals.

The yellow prussiate of potassium is added to give body and brilliancy to the negative, the sulphite of soda to prevent yellow color of negative and to preserve the developer.

If the shadows do not remain clear, add to 8 ounces of developer from 20 to 40 minims of bromide solution (No. 3).

Plates condemned as foggy or too rapid and lacking intensity will generally work perfect and clear with a small dose of bromide solution.

If more intensity is desired, add a little more pyro than usual, and be sure to carry the development far enough.

To correct overexposure, add bromide solution and a little more pyro to the developer.

An underexposed plate can be improved by diluting developer with water, or after developing by transferring the plate, *without draining*, from the developer to a dish containing water enough to well cover the plate and leaving it there for some time, well protected against *all* light, before rinsing and fixing.

For drop shutter or instantaneous work, the last mentioned treatment is recommended.

Before fixing it is well to flow the plate with saturated solution of alum. Do not return solution to bottle, but throw off, then rinse and fix.

After fixing, place the negative in dish containing alum solution, to harden the film, then wash thoroughly.

THE PRINCIPAL CAUSES OF FAILURE.

1. Overexposure.
2. Use of too much sal soda or carbonate of potassium in the developer.
3. Use of impure sulphite of soda, or such as is too old and decomposed by contact with air.
4. Introduction of impurities into developer.
5. Traces of white light entering camera, tablet, or dark room through holes in wall, underneath or on side of door, etc.
6. Exposing plates to white light while fixing, or before they are thoroughly fixed—this will never do with my "lightning" plates.
7. Use of too strong light for developing, whether the light is green, yellow, or red.

We commend the above directions for their brevity, and also for their usefulness to a beginner. It frequently happens that some unobserved minute leak of light in the camera front or camera bellows will be sufficient to ruin a sensitive plate which is perfectly good and clear.

In the taking of instantaneous views, where the camera and lens is exposed to strong sunlight, it is advisable to cover the camera bellows with the focusing cloth, and also to protect the plate holder in the same way. The diaphragm slit in the lens tube should be covered by a broad rubber band, or it may be protected by tying the pocket handkerchief around the tube.

An excellent plan of testing the light-tight qualities of a plate holder is to remove the lens board and look through the aperture, having the head protected by the focusing cloth. With the slide end of the holder facing a strong light, upon drawing out the slide, any leakage will be easily observed. If the valve in the holder does not close tightly, by reason of defective springs, or the warping of its different portions, a constant pencil or pencils of white light will be seen to stream in sideways across the face of a plate.

Plate holders should be carefully tested for these defects, at frequent intervals, if good, clear work is desired. In two or three instances we have found camera bellows which were supposed to be absolutely light-tight, when held in clear sunlight, to admit white light as if it was coming through an extremely fine sieve. The use of yellow prussiate of potash in the developer, as advised above, is really not necessary, it having been discontinued by the originator, Mr. H. J. Newton. Better effect is obtained by using equal quantities of carbonate of potassium and carbonate of soda.

Photographs of Lightning.—As the season of thunder storms is now at hand, an effort is being made by the Royal Meteorological Society of London to secure as many photographs of lightning as possible, in order that the peculiarities shown in the various phases of a lightning flash may be scientifically studied.

We would suggest a similar course be pursued by the U. S. signal service, and recommend that all its observers, scattered over the country, be supplied with suitable photographic apparatus, not only for photographing lightning, but also other meteorological phenomena, such as approaching cyclones, and the numerous peculiar cloud effects often observed.

The following are the instructions issued by the Royal Society: "It is desired to obtain photographs of flashes of lightning, and the council will esteem it a favor, first, if any one will send to the secretary copies of photographs of flashes of lightning that may have been already taken, and second if the reader will endeavor to procure such photographs himself, or interest others in the work.

"No particular difficulties are presented, and all that is required is to employ a rapid plate and a rectilinear lens with full aperture, leaving it uncovered at night during a thunderstorm, for a short time, in the direction of its probable approach. The ground glass of the camera should be set at the equivalent focus of the lens, or for objects at least 200 feet away. After the development of the plate, flashes of lightning will be found in some cases to have been impressed upon the plate, the only uncertainty being whether any particular flash will happen to fall within the field of view

"It is hoped many amateurs and professional photographers will take up this interesting branch of the art. We shall be happy to receive copies of such photographs, with particulars as to the time of night, also lens, stop, plate, and developer used.

"The address of the assistant secretary of the Royal Society is William Marriott, 30 Great George Street, Westminster, London, S. W., England."

WHEN the next decennial census is taken, three years hence, it is computed that New York City will have a population of two millions and Brooklyn of one million. That fact alone assures a pretty steady boom to every legitimate business hereabouts.

Many Items of Interest.

Edwin Clark says, in the *Architect* (London), that whenever space is crossed by any kind of structure inducing no lateral thrust on the abutments—that is, in all beams or tubes, whether round, oval, rectangular, or of whatever form, as also in all trussed roofs, trellis bridges, bowstring arches, etc.—the transverse strength of structures of similar section, but otherwise of any magnitude, is directly as their sectional area and depth, and inversely as their length. We have been careful to observe that this is founded on the assumption of all these structures being of such dimensions as to preserve their form, and to fail by actual crushing or extension, and not by distortion. Even in the case of structures in which the horizontal thrust is resisted by the abutments, as in suspension bridges and arches, this principle is practically available with a little modification. In fact, there can be no change in the direction of the vertical force at the supports without the intervention of a lever; and in the case of all these structures, this force at each end of the beam is transferred into horizontal strain at the center by an act of leverage, one arm being always the semi-length of the beam, and the other some fraction of the depth, which must in similar sections vary directly with the depth.

Cut flowers may be preserved fresh, it is said, for a long time in the following manner: Get a glass shade and place it on a non-porous vessel to form a stand; put water round the bottom to keep the shade air-tight, then procure fresh cut blossoms, put them in water immediately, drop into the water in which the flowers are placed a small quantity of spirit of chloroform, and place the shade over them at once. The flowers thus treated, some writer says, will keep fresh for months, but one should hardly expect they would be in a very fresh condition after their four weeks' confinement, but the new preserving process is worth trying. Care should be taken to have all in readiness. As soon as the chloroform is put in, place the shade over them, and water always kept round the bottom. A large soup plate would do for this.

The *Millers' Review* says: The tempering of mill picks is more a matter of care and observation than any special material used in the process. More picks are spoiled by burning or overheating the corners than by any other part of their manufacture. A slow fire and heating back from the point is an essential feature. Do not draw the edge thin. Leave it a little blunt and grind for the proper edge. Heat to a cherry red, no more at the corners than in the middle. Dip in clear water, and draw the temper to a full straw color. Brighten the edge surface on a grindstone or with emery paper before tempering.

Cheap postage with Mexico (as cheap as with Canada) comes into force on and after July 1, and a practical reciprocity treaty, applying to imports and exports through the mails in packages not weighing more than four and a half pounds.

Mr. J. S. Jeans, in his history of steel, says from first to last Mr. Bessemer's patents have brought him royalties to the value of £1,057,000, more than $5,000,000, this country paying him a large portion of it. Nor is this all. Mr. Jeans, speaking of the immense profits of the firm of which Mr. Bessemer was a member, says that on the expiration of the fourteen years' term of partnership of this firm, the works, which had been greatly increased from time to time, entirely out of the revenues, were sold by private contract for exactly twenty-four times the amount of the whole subscribed capital, notwithstanding that the firm had divided in profits during the partnership a sum equal to fifty-seven times the gross capital, so that by the mere commercial working of the process, apart from the patent, each of the five partners retired, after fourteen years, from the Sheffield works with eighty-one times the amount of his subscribed capital, or an average of nearly cent per cent for every two months—a result probably unprecedented in the annals of commerce.

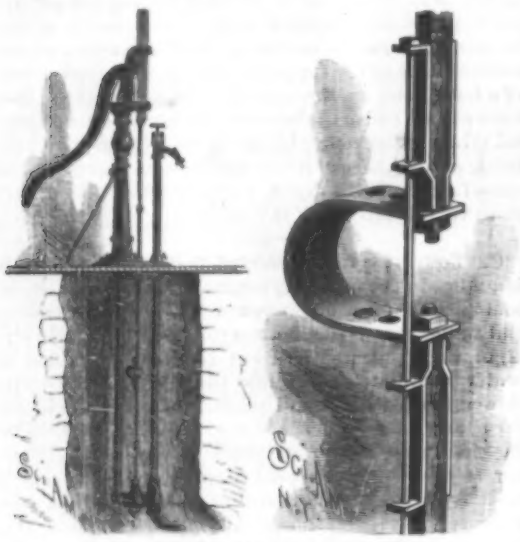
It is a settled fact that a patentee is invariably entitled to "fair equivalents." The use of the words "or equivalent" in a claim does, therefore, not enlarge its scope, and its use is not allowable unless the equivalent or equivalents are specified. This was Commissioner of Patents Montgomery's decision in a case which came before him last April.

A New Unit of Time.

M. Lippmann, the well known *savant*, has recently proposed to the French Academy of Sciences the substitution of a new unit of time for the ordinary second, which he regards as an arbitrary and variable unit. The unit proposed would be an electrical resistance which can be shown to represent an interval of time—the resistance, say, of a cube of mercury. M. Lippmann gives a method of practically determining the unit by means of an artificial resistance and condenser—apparatus which he considers likely to be more constant than the standard clock.

AN IMPROVED PITMAN OR PUMP ROD.

The device herewith illustrated, which has been patented by Mr. John Fay Loomis, of Shelby, Iowa, is designed to render the pitman or pump rod used with a windmill or for similar purposes elastic in the direction of its length. This is effected by the interposition of a U-shaped spring, or elastic cushion, between two sections of the pump rod, the different holes shown in the arms of the spring giving a greater or less range of spring movement, according as the sections are adjusted in the holes closer to or farther from the bend of the spring. At the side is a guide rod, arranged in offsets near the ends of the pump rod sections where the spring is inserted, to preserve the alignment of the sections. One of our illustrations shows the invention

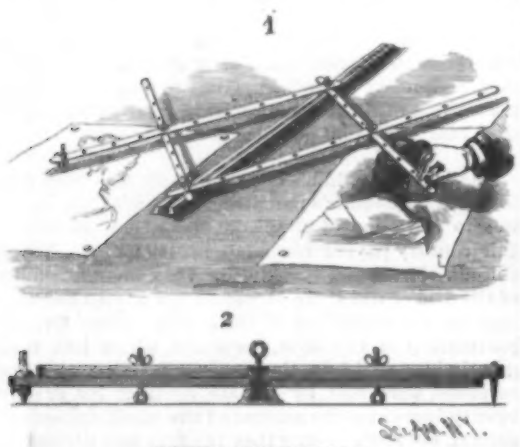


LOOMIS' PITMAN OR PUMP ROD.

as applied to a pump, and the other is an enlarged detail view. This device is calculated to take up excessive strain and jar, and also to cause a shorter stroke for the pump piston in proportion to the increased speed of the wheel, thus rendering the pump more uniform in its action.

AN IMPROVED UNIVERSAL PANTOGRAPH.

The invention herewith illustrated provides a pantograph which will not only copy, enlarge, and reduce drawings, but is also adjustable for reversing them and for caricaturing. The arrangement of the pivoted bars and the series of holes therein will be readily



RICHE'S PANTOGRAPH.

understood from the illustration, as well as the purpose of the central longitudinal bar and its slides, a cross sectional view in Fig. 2 showing the groove in the central bar in which the slides move.

To copy an engraving, the arms are balanced as shown in the picture, their motion being limited by the stationary pivot shown at the lower end of the central longitudinal bar. A tracing point in one arm of the pantograph is then carried by the hand over the details of the picture, which are reproduced by the pencil carried by another arm. Enlargements and reductions are effected by placing further in or out, in the holes shown, the bolts pivotally connecting the cross arms, thus increasing the leverage of either the pencil or the tracing point. When it is desired to use the pantograph in caricaturing, the connection between the bars is made unsymmetrical, so as to either elongate or otherwise distort the picture being copied. In employing the pantograph for reversing, pivotal screws are inserted in both slides, and the slides themselves left free to move in the central longitudinal slot. Lines then drawn parallel with the central bar, and by the sliding of the pantograph therein, will be made by the movement of the entire pantograph, and will be parallel, but when drawn at right angles to the bar they will be formed in opposite directions on its opposite sides, reversing the picture. Thus a face looking toward the right in the original can be made looking toward the left in the copy, and all of the lines drawn by the instrument when so adjusted will be reversed.

This invention has been patented by Lieut. Charles S. Riché, U. S. Corps of Engineers, Willet's Point, L. I., N. Y.

A New Alloy.

A new alloy has been discovered by Herr Reith, of Bockenheim, which is said to practically resist the attack of most acids and alkaline solutions. Its composition is as follows: Copper, 15 parts; tin, 2·34 parts; lead, 1·89 part; antimony, 1 part. This alloy is, therefore a bronze with the addition of lead and antimony. The inventor claims that it can be very advantageously used in the laboratory to replace vessels or fittings of ebonite, vulcanite, or porcelain.

A REVOLVING SELF-VENTILATING CHURN.

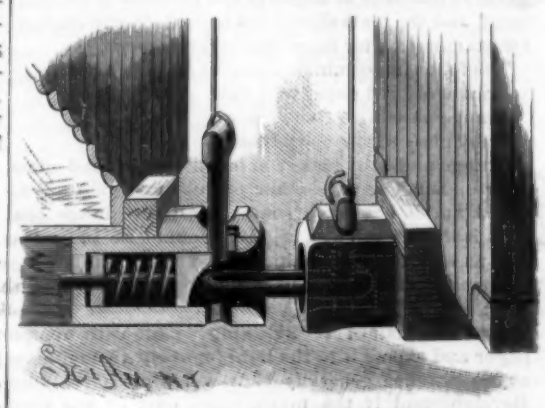
A churn which automatically effects a practically perfect ventilation of the churn body when in operation, and is designed to closely regulate the temperature of the air supplied, is shown in the accompanying illustration, the apparatus having been patented by Mr. Robert C. Boekler, of Mankato, Minn. The churn body is preferably slightly oval, and on the side carrying the operating crank handle it is journaled, by a shouldered shaft or gudgeon, fixed to a plate secured to the side of the body, having a bearing in a short standard, the bottom portion only of which is seen in the illustration. The opposite journal, being the one fully shown in the picture, is a double pipe or tube, one within another, a metal plate fixed to the body giving a good bearing, and the plate having a suitable collar and gland to form a stuffing box, by which the escape of any liquid from the churn may be prevented. The inner pipe is open at its inner end to the interior of the churn body, and at its outer end is connected by a short flexible tube to the discharge passage of an air pump, secured near the top of the standard, and operated from the shaft journaled therein as the churn is revolved. The pipe supplying air to the pump is laid in a coil in a tub or suitable receptacle in which ice may be placed, so that the air will be cooled in passing through the pipe, its outer end terminating in a rose nozzle or strainer, to prevent the passage of insects or dust with the air drawn in. When churning is to be done indoors in cold weather, this air-cooling apparatus will not be needed, but the pipe leading thereto may be disconnected, and its open end led to the outer air through a suitable opening in door or window. This air-supplying pipe may also be used, on disconnecting it from the air pump, for introducing water to the interior of the churn without removing the cover. The outer portion of the double pipe forming the journal is for the egress of the air thus forced in, after it has performed its mission of abstracting the gases and animal heat from the cream being agitated within the churn body, and thoroughly aerating the same. The inner end of this pipe is fitted with a cap of conical crimped form, adapted to prevent the passage of drip liquid into the tube, and its outer end is bent over at the top, and fitted with a rose head to prevent the passage of flies or other insects to the inside of the churn. The shorter of the two standards on which the churn body is journaled is hinged to the base, to allow the churn body to be readily removed, and the cover, which is firmly clamped down with cross pieces, is fitted with a glass, to allow of the ready inspection of the contents of the churn body.

The inventor who has devised this apparatus was led thereto by his experience as a cooper in making churns for farmers. Where large, old fashioned, dasher churns were called for, it would be with the direction that the hole in the lid be made considerably larger than the handle, that air might thus be carried in and out of the churn. This is considered an essential to the making of good butter, no less than for expediting the process, and the inventor has sought to fully supply this want in revolving churns.

BOEKLER'S IMPROVED CHURN.

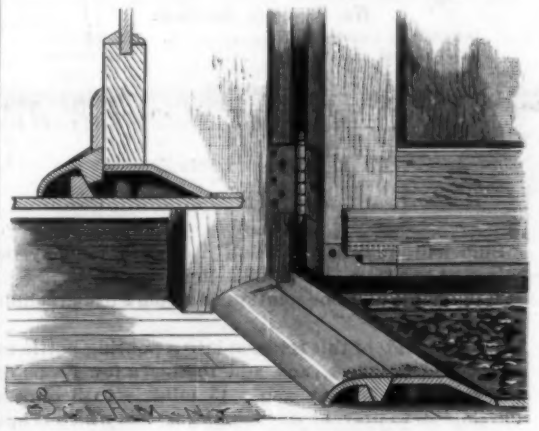
AN IMPROVED CAR COUPLING.

The invention herewith illustrated presents a device by which cars will be automatically coupled on coming together, thus relieving trainmen from the dangerous work of going between the cars for this purpose. The chambered head of the drawbar has the usual vertical aperture, and within the chamber is a follower having its head beveled or cut away on the lower part, a spring being placed between this head and the rear



SELF'S CAR COUPLING.

wall of the chamber. The pin is cut away at its lower end to form a shoulder, and has a lug projecting laterally from one side in position to rest upon the top of the drawbar when the pin is withdrawn from the coupling link, as shown in the sectional view to the left, the view at the right hand of the picture showing in full and dotted lines all the parts in coupled position. The coupling pin has a T-shaped head, which rests in a transverse notch of the drawbar covering, preventing the pin from turning when the cars are coupled. When the link enters the chambered head of the drawbar, it pushes back the follower and releases the pin, which drops and effects the coupling, the uncoupling being effected by withdrawing the pin by means of a rod extending to the top of the car. The



ALLYN'S CARPET AND WEATHER STRIP.

coupling pin may, however, be turned so that the coupling will not operate, thus enabling trainmen to push the cars without coupling them.

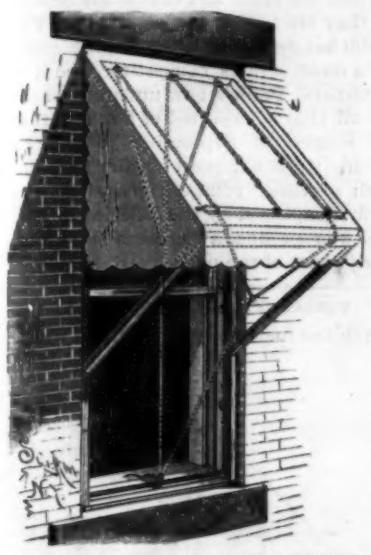
This invention has been patented by Mr. Lavega Self, and for further particulars address Mr. J. G. Clarkson, of Arcadia, Iron County, Mo.

A COMBINED CARPET AND WEATHER STRIP.

A construction adapted to be placed beneath a door, to serve the purpose of a finishing strip at the edge of the carpet, and which, when the door is shut will operate automatically to tightly close the bottom seam against the admission of cold air, is shown in the accompanying illustration, and forms the subject of a patent recently issued to Mr. D. L. Allyn, of Bloomington, Ill. It is composed of two longitudinal sections, the inner one fixed in its place by screws, and both chambered on their under sides, hook lugs from the under side of the inner section engaging lugs on the under side of the outer section. The latter has, on its end next to the hinged side of the door, an upwardly projecting lug, which, when the door is closed, is struck as by a cam by the inner lower end of the door, or by a wear plate thereon, causing the faces of the lugs connecting the longitudinal sections on their under sides, to ride upon each other thus lifting the inner side of the outer section so that it will rest against the side of the door bottom as shown in the sectional view. A moulding across the lower outer side of the door is cut away sufficiently on its lower inner corner to give room for the movement of the adjacent lug on one end of the outer section, and the lower edge of this moulding is undercut to receive and form a tight joint with the inner edge of that section as it is raised by the closing of the door, its outer edge resting upon the floor. This outer section is readily detachable for cleaning purposes.

AN EASILY ADJUSTED AWNING FOR DOORS OR WINDOWS.

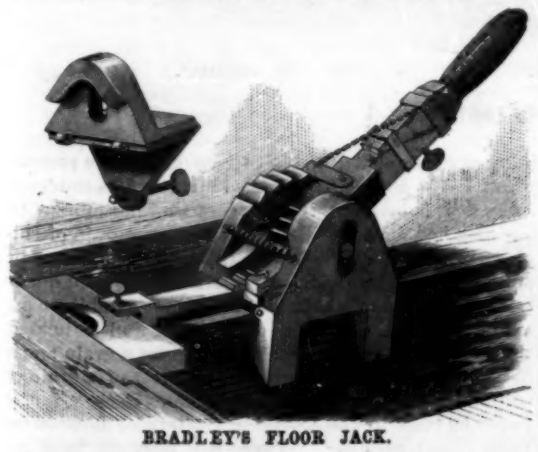
An improved awning, by which the admission of the sun and light may be easily controlled, without interfering materially with the access of air to the rooms of a store or dwelling, is shown in the accompanying illustration, the contrivance being the subject of a patent issued to Belle D. Pennington, of 418 Chandler Avenue, Evansville, Ind. The main frame is made in a form adapted to be secured in a window frame, outside of the outer sash, and held in position by thumbscrews, while to its top portion is hinged another frame, composed of two sections hinged to each other, the lower section having hooks at each side adapted to engage screw eyes on the inner surface of the two vertical members of the main frame, the awning frame being more or less raised or lowered, according as the hooks on the lower hinged section are placed in eyes that are higher or lower on the main frame. The awning is fastened at the top to the upper crossbar of the outer folding frame, and carries a rod at or near its lower outer edge, three cords being attached to the rod, which pass up through rings on the under side of the awning to eyes on the under side of the top crossbar, and thence downward, the cords being joined so that the three can be drawn upon by a single cord within convenient reach, and thus fastened to a hook or an eye at the center in the bottom bar of the main frame. Outer cords also extend downward from the rod attached to the lower end of the awning, and are joined in a single cord for convenient attachment to a hook or eye in the bottom of the main frame, these cords, together with a vertical cord to which the side portions of the awning are attached, affording a ready means of raising or lowering the awning without disturbing the frame. When the awning is not required, the folding frame swings inward against the main frame in such position as to be quite out of the way, and the awning itself is entirely drawn to the top of the frame by the cords. The whole device can be easily put in place or taken down without the aid of any special or expert help.



PENNINGTON'S PORTABLE AWNING.

AN IMPROVED JACK.

The invention illustrated herewith provides a jack more especially designed for holding the boards in position in laying floors, but the device may also be used as an ordinary lifting or pressure jack. It has spring-connected side pieces, hinged to a central box with open ends and top, the side pieces having ribbed jaws adapted to take a firm grip upon the floor beam, and there being a rack-faced sliding bar in the bottom of the box, the outer end of the bar being enlarged and slotted to hold detachably a grooved and recessed block to receive the tongue of the floor strip to be jacked into position. Upon the upper inner surface of each side piece is formed a segmental cam surface, the entire upper semicircular surface of one of them being provided with transverse rearwardly inclined teeth. A lever is pivoted in apertures in the sides of the central box, the pin whereby the lever is journaled being made to project through vertical slots in the side pieces, and the lower end of the lever being made circular, with teeth adapted to mesh with the rack surface of the slide bar, to propel it backward or forward in the box. Each side of the lever has wedge-shaped lugs to engage the faces of the cam projections of the side pieces when the device is placed upon a floor beam, and force the teeth or ribs of the jaws into the beam as the slide bar is carried forward, and also to limit the backward and forward throw of the lever. The manner of attaching the handle is plainly shown in the illustration, but the part grasped by the hand is on a sleeve and connected with a spiral, by which, through a chain and pawl, the latter may be made to engage the teeth upon the upper surface of one of the side pieces, to hold the slide bar in the position to which it is carried when the lever is operated, the chain being of such length that when the sleeve is in its normal position the pawl will be elevated above the teeth. The spiral spring shown across the front of the jack serves to steady the side pieces in position, and just below it, attached to one side of the box, near the bottom, is a spring having one end bent at right angles over the front edge of the box, the angular end of this spring being adapted to engage the teeth of the slide bar to retain the latter in a given or fixed position. The recess in the grooved block abutting against the floor strip affords room for conveniently driving a nail, and the device can then be easily and quickly removed and entered in a similar manner upon the next beam. The small figure shows an extension piece designed for use in place of one of the side pieces when the floor beams are more than two inches thick.

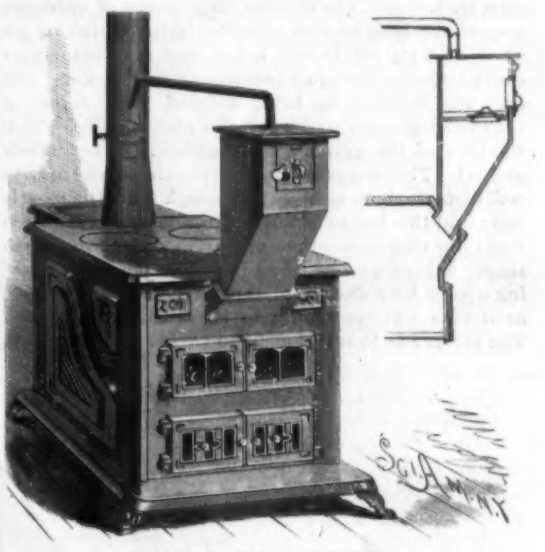


BRADLEY'S FLOOR JACK.

This invention has been patented by Mr. William E. Bradley, and for further particulars address the Giant Floor Jack Co., Roscoe, N. Y. Patents have also been taken out upon it in foreign countries.

AN IMPROVED FEEDER FOR STOVES.

A device especially designed for feeding cooking stoves, and intended to be particularly useful where a rapid-burning fuel is employed, is shown in the accompanying illustration. It forms the subject of a patent recently issued to Mr. Melburn S. Briggs, of Oxford, Nebraska. The magazine or feeder is intended to fit upon and be supported by that portion of the stove usually adapted for a feed opening, as many stoves are now made, although it may be of different construction for stoves with other kinds of feed openings. As will be seen by the sectional view, the feeder is divided into an upper and a lower part, the latter being the fuel box, so shaped as to facilitate the downward feed of the fuel by gravity. The upper part is an air and smoke chamber, in communication by a small pipe with the main smoke pipe, and having an opening, covered by a lid, to the fuel box below. There is a door in this top part for putting in fuel, at which times the lid of the fuel box is removed, the small pipe then conveying away any smoke which might otherwise escape, and also affording a means of assisting in the ventilation of the room, when a small damper in the door of the top chamber is opened. The small pipe also assists to prevent smoke in the room when the damper in the main pipe is too much closed, or when the top covers of the stove are removed.



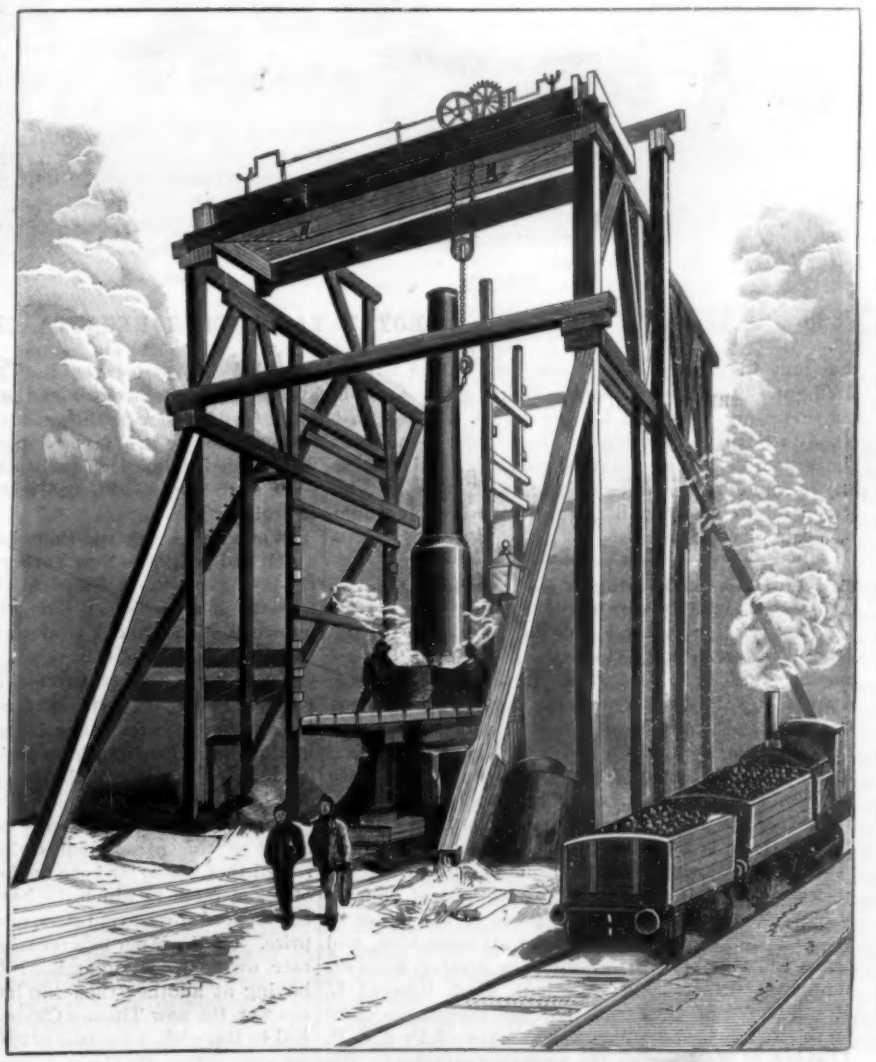
BRIGGS' STOVE FEEDER.

MANUFACTURE OF LARGE GUNS.

The London *Graphic*, describing the works of Sir William Armstrong at Elswick, says:

The great ingot out of which a gun barrel is to be made comes from the steel works of the required length and a little more than the needed girth; and it is first taken to the shop to be rough turned and rough bored. The boring machine, composed of an arrangement of chisels carried on the end of a revolving horizontal shaft, is made to work against the solid ingot, so as to take out a center cutting of 9⅛ inches. This first cut is necessarily made in thrusting fashion, but the two others, which enlarge the bore as far as is necessary at this stage, are made by drawing the cutter through the tube. The work is very slow, but the action is virtually automatic, the rate of progress being from four to five inches per hour. The machine goes on night and day, the only stoppages being to examine the work and insure absolute accuracy. After rough boring, the barrel is taken to another shop to be heated and plunged into a bath of oil, to be hardened and toughened; after which it is annealed and then passed on to be fine bored, a delicate and a time-consuming process. Next, the barrel is turned in the lathe—a most powerful machine when heavy gun barrels and cylinders have to be operated upon; and being smoothed inside and out, it is ready to be placed in the shrinking pit to have the successive "jackets" placed upon it, of which the modern steel gun is built up.

When guns were made of iron, the outer jackets were coiled on; but coiling is now superseded, and the shed once devoted to this interesting operation is now employed for other purposes. Steel, unlike forged iron, cannot be welded out of coiled rods or plates, and it is deemed sufficient to give the increased strength required at the breech end by successive coats of metal, which are tightly shrunk on the top of each other. To insure absolute closeness of contact, with some degree of compression, each cylinder is bored so as to be slightly smaller than that which it is to inclose. When heated nearly to redness, it expands so as to slip on



SHRINKING A COIL ON A 110 TON GUN.

with ease; but, as it cools, it grasps more tightly than the clutch of a miser's palm. The largest sized guns are composed of five separate cylinders, counting the barrel, which is inclosed by the first jacket to the muzzle point. There are scientific reasons relating to the laws of expansion under the strain of explosion which determine the degree of compression exercised by these outer cylinders; but with these we need not trouble the reader.

As it takes from fourteen to fifteen months to build up a 110 ton gun, one of these large pieces of ordnance may at any time be seen standing in the shrinking pit as it is sketched by our artist, and the visitor may easily be lucky enough to see one of its "jackets" put on. The building up being finished, the joinings of the cylinders must be turned and planed; after which the bore of the gun has to be gauged and accurately ground. The compression of the outer hoops always contracts the bore more at the breech than the muzzle end; and this has to be cut and ground out. It is then ready for rifling—another operation consuming much time. It is performed by an ingenious machine working upon a long shaft, and so constructed as to revolve as it cuts correspondingly to the twist of the groove. The cutter has to travel eight to twelve times through the guns in making one groove; and in the largest sized guns there are as many as eighty grooves. It is not surprising, therefore, to hear that it takes at least a month to rifle a 110 ton gun. It need not be said that the most absolute accuracy is necessary, and that at any of these later stages of manufacture a mistake which might easily spoil the gun irretrievably would be a calamity.

The Thirty-sixth Meeting of the American Association for the Advancement of Science.

New York, for the first time in the history of the American Association, is to be the place for its annual meeting. It is to last from Wednesday morning, August 10, until Tuesday evening, August 16. Matters in this city are in charge of a local committee, of which President Barnard, of Columbia College, is chairman. At his request, the trustees of Columbia College have tendered the use of the several halls and offices of the college for the purposes of the association.

Everything is hoped for from this meeting. Last year the meeting was held in Buffalo, and the attendance seriously fell off, but the attractions of the metropolis and the favorable auspices of the place of meeting will, it is believed, prove an attraction, and cause the members to assemble in greater numbers than ever before. The president, Prof. Edward L. Morse, of Salem, Mass., will call the meeting to order on the first day, and will resign in favor of Prof. S. P. Langley, of Washington, the incoming president. The general meeting will adjourn, and the different sections will reassemble for purposes of organization in halls assigned them. In the afternoon the sections will meet, and the vice-presidents will deliver their addresses. In the evening Prof. Morse will deliver his presidential address.

The list of eminent names of vice-presidents and secretaries insures a valuable series of papers, and we believe that the New York meeting will certainly compare in interest with the Montreal meeting of 1885. The association has a future before it, and for the sake of that future, should meet with all encouragement. An affiliation with the foreign associations of like name and constitution is to be hoped for, and movements in that direction have already been inaugurated.

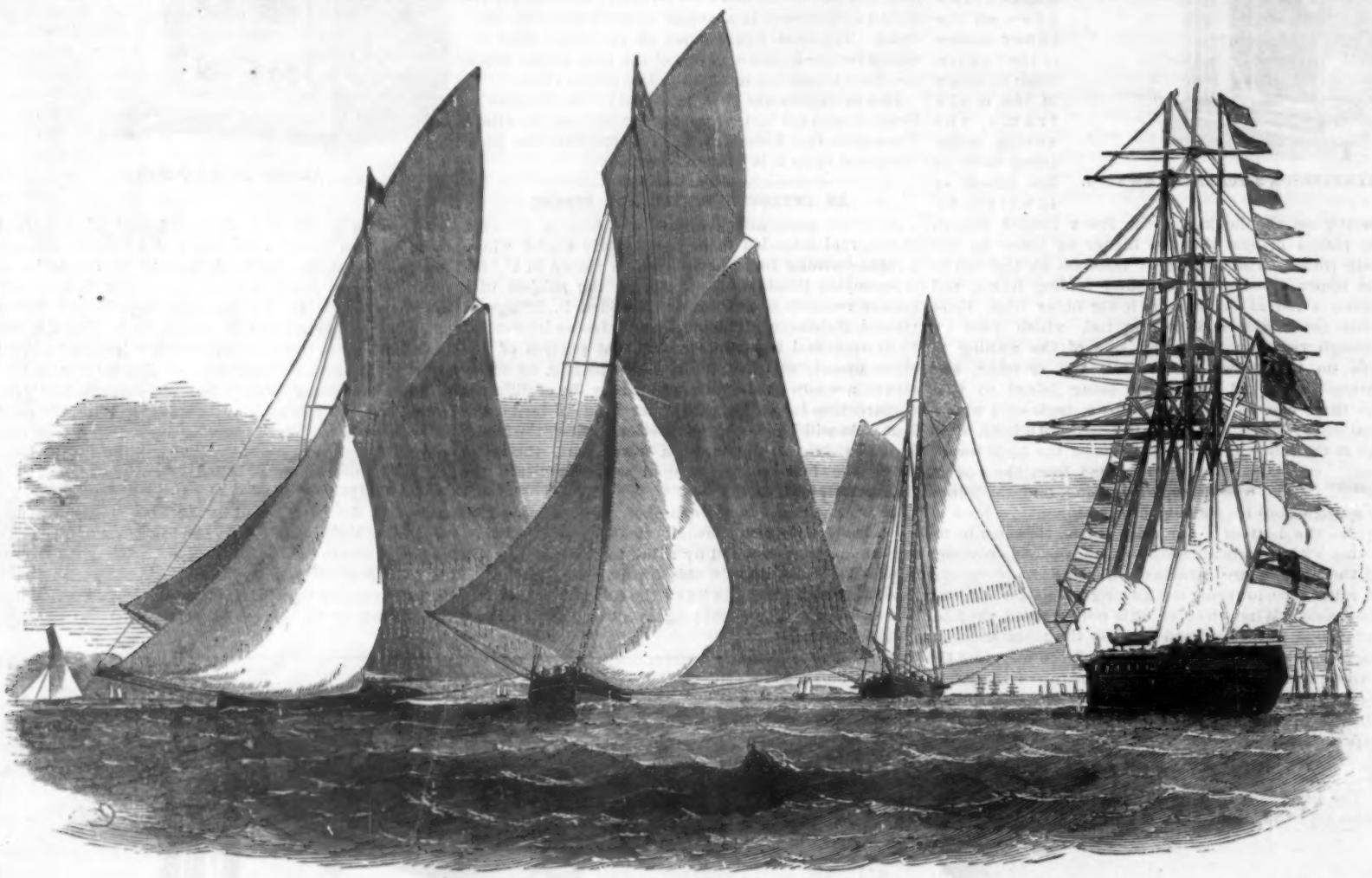
THE NEW BRITISH RACING YACHT THISTLE.

Shortly after the disastrous defeat of the Galatea in American waters last fall, it was rumored that a final and desperate effort was to be made to wrest the famous America or Queen's cup from this side of the Atlantic, and to that end a new craft was being built, the design and details of which, it was said, would be different from anything hitherto seen. The rumor was finally confirmed, but the whole matter was kept shrouded in mystery; and although it was finally known where and by whom the new yacht was being built, no admission to the yard was attainable, and she was only visible to a favored pledged few. Attempts were made by American yachting men to obtain some clews as to her probable size, but even this was not successful.

At one time a clew was thought to be discovered, and a rich and patriotic New Yorker immediately ordered the laying of a keel for a yacht of smaller size than the Genesta and Galatea; but when the Thistle was launched, it was found that these rumors were incorrect, and that the new boat was about the size of the Galatea, being, in fact, two feet less on the water line. General Paine, of Mayflower fame, at once decided to try and improve on this celebrated racer, and is now having built for him, from designs by Mr. Burgess, a steel yacht, which will also be of a different type from anything now afloat.

Much interest has suddenly been developed in the result of this experiment, owing to the remarkable record that has so far been made by the Britisher. Out of seven races in which she has so far taken part, she has secured three first prizes, one second, and one third prize. On the other two occasions she was out of the race, owing to having missed the buoy in a fog and having at another time run into a calm. On May 28 she won the new Thames Channel match from Southend to Harwich, a distance of 50 miles, beating her nearest competitors, the Genesta (our former rival) and Irex, by nearly two hours and three-quarters. In this race she is said to have crossed the line with a speed of 18 knots an hour.

The Thistle was built by Messrs. Henderson & Co., of Glasgow, Scotland, and is owned jointly by Mr. James Bell, of Glasgow, and (it is reported) by Mr. Clark, the famous Scotch thread manufacturer of Newark, N. J. She is built throughout of steel, and she measures 85 feet on the load water line; extreme breadth, 20 ft. 4 in.; depth of hold, 14 ft. 1 in.; registered tonnage, 100 tons, or 140 tons rating. The mast is of Oregon pine, and the spars and canvas are American, inasmuch as they are the biggest on record. The ease with which she has defeated all the English crack yachts makes her a most serious competitor, and it is to be hoped that General Paine's new unnamed yacht will prove to be all that is expected of her, and that the international contest of September 26 will be marked by the manly spirit of honest rivalry that has characterized each of these competitions since the Queen's cup was first captured by the America in 1851. In this connection we reproduce a picture of this event, taken from an early print of the period.



ROYAL YACHT CLUB REGATTA.—[From Print published in 1851.]

Effects of Lead.

Mr. Wynter Blyth nas had an opportunity of examining portions of the bodies of two out of five persons who have at different times died more or less suddenly from, as it is believed, the effects of lead poisoning. In one case he separated about a third of a grain of sulphate of lead from the liver and about the thirteenth of a grain from one kidney, besides finding lead qualitatively in the brain. In the other he was able to examine the brain with more minuteness, and estimated that here the cerebrum contained about a grain and a half and the cerebellum about a quarter of a grain of sulphate of lead. Mr. Blyth went on to remark, in the paper he read to the Chemical Society of London on these investigations: "There has hitherto been no reasonable hypothesis to explain the profound nervous effects of the assimilation of minute quantities of lead, but if it is allowed that lead forms definite compounds with essential portions of the nervous system, it may then be assumed that in effect it withdraws such portions from the body. In other words, the symptoms are produced, not by poisoning, in the ordinary sense of the term, but rather by destruction—a destruction, it may be, of important nerve centers."—*Lancet.*

Photographs in the National Park.

One of the most skilled and distinguished of practical photographic artists is Mr. F. Jay Haynes, of Fargo, Dakota. He is the official photographer to the Northern Pacific Railway. A series of new pictures by him consist of a number of admirable views in the National Park, Colorado, showing the great geysers in operation, snow scenes, etc.

Correspondence.

Exhaust Fans for Slate Dust.

To the Editor of the Scientific American:

Exhaust fans are now used to carry off the dust made in turning grindstones at the Cleveland Stone Company's quarries, preserving the operators harmless, where formerly the loads of dust rendered death sure, from continuous inhaling, within four years. Why not apply the same remedy to draw off the dust from the hundreds of slate pickers at the anthracite coal breakers?

FARRELLY ALDEN.

Pittsburg, Pa., June 1, 1887.

How Snakes Climb Trees.

To the Editor of the Scientific American:

In your valuable journal of 14th May, you quote from an article which suggests that young men most liberally educated may be ignorant of many facts and practical matters, such, among many others mentioned, as "how steel is made, or how a snake can climb a tree." I have seen a snake climb a tree, and while his may not have been the orthodox method, nor in accord with the usages of the best ophidian society, it was to me a most interesting sight, and the account may be of some interest to others. A few years since I was walking along a broad road in Richmond County, Georgia, when from the opposite side of the road coming directly toward me I saw a "coachwhip," a snake much like the common black snake in form, but in color a very dark brown some two thirds of its length, the other third to the tip of the tail being a light brown, in appearance, from the peculiar markings, much like the lash of a whip. Having nothing with which to kill the snake, I thought to amuse myself by preventing his getting to cover in the "thick" just beyond me; but to turn back would leave him exposed for quite a distance, so, not being in a fighting humor, he made a rush for a water oak which grew just beyond me but not on a direct line with me, the long branches of which came down to within four or five feet of the ground; then rising until he seemed almost to stand on the end of his tail, he shot up like an arrow through the branches, getting his grip entirely by lateral pressure and not by coiling around the branches as I thought he would do.

WM. L. WAKELEE.

Savannah, Ga.

Noises to Promote Sleep.

To the Editor of the Scientific American:

A sleep preserver such as suggested in one of your recent issues would be a full size blessing to thousands of mothers, and would save the lives of many infants and invalids, especially in cities, where we are at the mercy of forty different kinds of discordant sounds.

No special instrument is necessary. Any monotonous continuous sound is a lullaby. "The sweetest and soundest sleep is promoted by sound." We now have frog farms and ostrich ranges; who'll be first to inaugurate a new American industry, by establishing a bumble-bee ranch, and selling bees trained to buzz a man to sleep? Days when the bee is not needed at home, the owner can take him to the office, and whenever a chronic bore drops in, the bee can be let loose to out-buzz him.

But there is no better sleep guard than machinery. A person having a spring or electric or water motor to run her sewing machine need only remove the needle, place the machine near the patient, and let it run. The infant or invalid would soon become accustomed to it, and perhaps, as the castoria man says, "cry for it." Thus will the sewing machine sew or knit up "the raveled sleeve of care"—one stroke more than its manufacturers have hitherto claimed for it; and the coming mother will perhaps sing:

"Rock-a-by, baby; Grover and B,
Melodious music shall murmur to thee," etc.

S. N. STEWART.

Philadelphia.

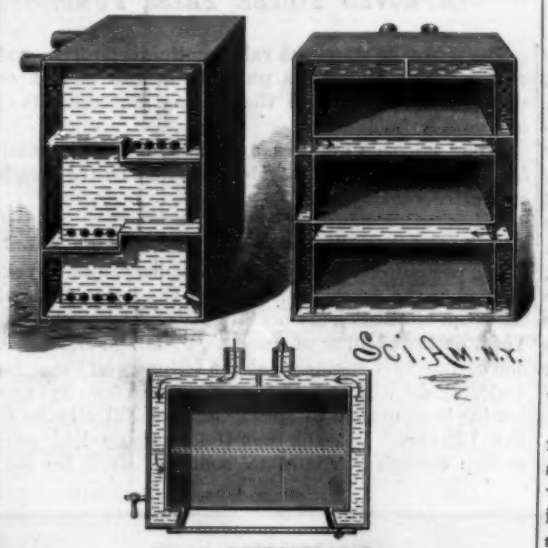
The Advantage of Thinking.

To have learned to think, whether learned in the schools or out of them, is to have attained the most valuable of all acquirements. Hard and stubborn facts in letters, sciences, or mechanics, however desirable in themselves, cannot be of the best practical value to their possessor until he has learned to think, and so is able to adjust his information to the constantly varying conditions and necessities of his occupation.

Any system of instruction which does not teach a man to think falls very far short of the best results of instruction, and leaves him without the most vital element of success. The *Jewelers' Journal* repeats what has been often said in these columns; that is, what a mechanic most needs to-day is to know how to think. He who can do this is never at a loss for ways and means, and is ever and always equal to every occasion, and can meet any emergency without hesitancy or confusion. He finds real pleasure in conquering a difficult job, for he can always conquer it, inasmuch as he is an inventor, and can create a way where there was none. A man who has learned to think continually separates and combines, and from the scraps which he gathers as he goes he constructs. Material is ever at his hand, and whether he is on a journey, in the shop, or the factory, his eye is ever observant and his senses alert. Having learned how to acquire knowledge, the *Journal* further adds, he never finds himself anywhere that something does not appear which he wants to see, and having seen, will not sooner or later put to practical use. The setting of a lathe tool, the adjusting of a band in a machine shop, even the turning of a crank or the skillful handling of a file, is more than likely to suggest some new "kink" to him, wholly unlike anything he is observing. He finds treasures unsuspected by the man whose mind, being simply a storehouse of blank facts, moves mechanically forward, observing nothing but that which is already constructed and complete. These treasures he stores as he gathers them, and at the call of a necessary occasion or an emergency they are combined into a complete whole by a process of which he himself is quite unconscious. Having learned to think, he sends forth every moment freighted with some sort of effort. He has learned "the value of work as a means of happiness and of change of work as a means of rest," and idleness is neither necessary nor recreative. He can catch an idea on the wing, and an idea gained is a source of true happiness. Such a man does not easily weary, and it is late in life before he grows old. He goes on gaining knowledge to the end, and his knowledge assimilates and becomes wisdom as he gains it.

A WATER COOLED REFRIGERATOR.

The refrigerator herewith illustrated, which has been patented by Mr. George E. Fell, of Trenton, N. J., is arranged to provide central storage chambers in connection with the walls of an outer inclosing case, in which, a proper water connection having been established, with such pressure as is usually required to conduct water through buildings, a constant flow or current will be maintained about the interior chambers. Our views show sectional and cross-sectional elevations and the plan, the dividing walls in the outer case separating it into spaces, by which the flow of water will be directed, from its entrance, around all sides of the interior storage chambers, until it reaches the exit pipe, as partially shown by the arrows. If it is desired to reduce the temperature below what would normally be effected in this way by the ordinary water supply, an ice receptacle may be supplied, and the water made to pass through it before entering the refrigerator. In this case it may be more convenient to utilize for other wants the water so cooled than to provide a regular water cooler, and a stop cock is provided, as shown in the plan view, at one of the corners near the door of the refrigerator, by which water may be drawn as desired.



FELL'S REFRIGERATOR.

What may be Accomplished by Energy and Perseverance.

Col. H. W. Pinckney, in *Dixie*, a newspaper published at Atlanta, Georgia, relates the following incidents, which came under the writer's own observation, where success trod closely on the heel of perseverance and industry:

A man can make a living, and also make money, in hundreds of different ways in this country, and it is a mighty good thing that this is so, else over-production would be the rule, not the exception. I know a man who is getting rich out of baby swings. It's a simple, cheap thing to make, and he started in a simple and cheap way to make them, his entire outfit of tools comprising two saws, two saw benches, a draw shave, two hand planes, a brace and some bits, a rough work bench. He didn't stand around with hands in his pockets waiting for somebody with capital to come along and boost him. Not much. He thought these swings would sell, so he made one and peddled it round until he found a purchaser. Then he made another and sold that, and thus he kept on until finally people began to think his swings were a good thing to have in the family, and they began to inquire for them. He started eight years ago, and alone did all the work of making and selling them. Things with him are very different to-day. He has a shop two stories in height, and machinery for sawing, planing, boring, mortising, turning, and sandpapering the material entering into the construction of these swings. In that shop forty men find constant employment, and, as I said before, the owner is getting rich out of it. Counting the wives and children of the workmen in that shop, there is a population of nearly or quite one hundred and fifty making a living out of one man's idea that a baby swing would sell. A baby swing is not a very big thing, but it is in this case big enough to keep quite a little village busy and comfortable.

A step ladder is a mighty handy thing to have around the house. Five years ago three men, by the closest kind of scraping, twisting, and borrowing, managed to get together five hundred dollars. They bought some lumber, rigged up a circular, or buzz, rip saw, and started in to make step ladders. For two years it was a struggle of the hardest kind; sales had to be made by personal canvass, prices obtained permitted no margin of profit, and the outlook was of such a discouraging nature that their friends and neighbors pitied them first, then prophesied dead failure, and finally laughed at their folly in sticking by a losing game. There came a change, however. A prominent house-furnishing goods firm one day wrote them for prices on five thousand ladders. The size of this possible order very nearly took them off their feet. They had sense enough, however, to understand that this big house would not give them the order unless prices were made away down, so they sat down and figured the thing over, and having decided that matter, awaited the result, which turned in their favor and they got the order. Then they went to work; each one took his coat off and pitched in; they worked sixteen hours a day until that order was filled, and it was filled on time, and each ladder was honestly made. The only expense they realized was for lumber, screws, and paint. They had done all the work themselves. This was the turning point in their business career. Within a month from the delivery of these five thousand ladders they had contracted with the same house for a monthly supply of two thousand five hundred. They were on their feet now, and began to push things. They are turning out to-day, with fifteen men, ten thousand step ladders each month, and have been doing this for more than a year. A step ladder is a little thing, but these men are making money out of them.

About fifteen years ago, in one of the big planing mills in Chicago, a strip of board catching, in some unaccountable manner, on a buzz saw, was hurled with violence against the leg of one of the workmen, breaking it and badly mangling the flesh. The injury resulted in incapacitating the man for performing the labor required of him in the mill, and he was compelled to seek other means of livelihood. A man of fine mechanical attainments, his endeavors very naturally sought outlet in that direction, so he built, after his own ideas, a scroll or fret saw, foot power, and rigged up a seat on it, as he was unable to stand for any length of time, and began sawing out and putting together articles for household ornament and utility. He regarded this as simply a temporary means of making a living. After a time he added to his scroll saw a light boring attachment and then a little turning lathe. Then he bought a cheap set of carver's tools. You see he was always looking out to save labor and to combine originality in the articles he turned out. Time ran along, and almost before he knew it, he was getting more orders than he could, alone, fill, so he hired a man to dress and prepare his materials, lay out the patterns, and put the articles together. Still his orders increased, and he hired another and still another man. To-day he has thirty men in his employment, and he does no physical labor himself. Making money? Yes, right along, but it was a very little thing that gave him his start.

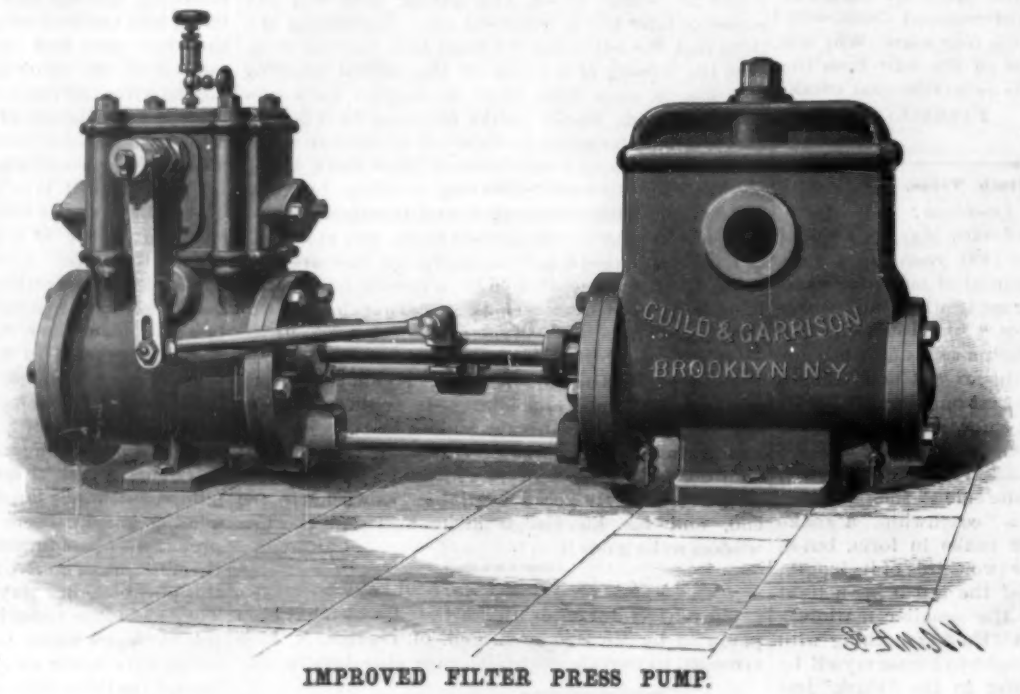
Now, the point I wish to make is this: Capital, in large amounts, is not necessary in the founding of industrial enterprises. A good deal of pluck and energy, and unconquerable perseverance, are better than money, because, having these, money becomes the result, not the means, of success. Money is valuable, not as the means by which an end may be accomplished, but rather because it is the result of an accomplished end. It has power, immense power, but without energy behind it, it is powerless. Perseverance and energy can make money, but money cannot make perseverance and energy. What I would like to see in our Sunny South is more small industrial establishments. I would rather see a dozen shops employing three men each, than one shop employing three dozen men. There is more money in the three dozen, because there is greater possibility for their expansion and growth. Don't wait for the establishment of big enterprises with heavy capital, but start little ones in a modest way, and then let them grow, as the majority of them surely will.

IMPROVED FILTER PRESS PUMP.

The separation of solids from liquids, the clarifying of liquors, and the washing of precipitates are operations required in many industries. For this purpose the filter press has been found a convenient and useful instrument. In the sugar industry it is largely employed, particularly in European factories, where the diffusion process obtains for the extraction of sugar from beets. In the mineral oil industry, it is used for expressing the oil from the paraffine; or, in treating animal oils, for separating the stearine. In the manufacture of drugs, extracts, chemicals, colors, starch, etc., it also finds a place.

The successful manipulation of the filter press depends in large measure upon having a pump adapted to the special service required. To meet the various requirements of filter press work, Guild & Garrison, steam pump builders, of Brooklyn, N. Y., have designed a special line of pumps, one pattern of which, known as class B, is shown in the illustration. The pressure required and the material to be moved must necessarily determine the pattern of pump best suited for the service. Class A, for instance, is intended for thick liquids and very heavy pressures; class C, for liquids containing fiber, pulp, etc.; class D, for liquids carrying grit or crystals.

The pump illustrated is adapted to moderate pressures and the pumping of liquids containing little or no gritty material. As with the other classes, it is the result of a long experience in the manufacture of pumping machinery generally, and of pumps for this service in particular. The liquid cylinder is cast in iron, bronze, or special alloys, has very few parts, and is arranged with the utmost simplicity. The passages leading to and from the pump barrel are made direct, free, and spacious. The valve openings are but continuations of these passages, and are free from obstructions. The liquor is thus able to flow without interception into and out of the pump barrel, and clogging or intermittent action is prevented. The novel arrangement of the pump valves aids this uniform flow. They are placed in direct line of the currents, and move up and down in cages, which, while they regulate the lift, do not obstruct the flow. Of course the form and material of the valves must depend upon the nature of the liquid. Access to the delivery or the suction valves and passages is obtained by removing a single large nut and taking off the valve cover. The valves can then be lifted out by hand if desired. The gauge and interchangeable system is followed in the manufacture of both the steam and pump ends and their parts, so that in case of any pieces breaking down or wearing out by exceptional usage, they can be easily replaced.



IMPROVED FILTER PRESS PUMP.

The action of the steam valve motion is positive and uniform, and allows the pump to be run at fast or slow speed, according to the varying requirements of the work to be done.

Other valuable features are claimed by the manufacturers, who should be addressed for further details of construction.

The Latest Intelligence from the Panama Canal.

The present condition of the Panama Canal was explained to the American Society of Civil Engineers at the room of the Society on Twenty-third Street, New York, on the evening of June 15, by Mr. T. Boulange, one of the chief engineers at the Isthmus on the great undertaking, who arrived from Panama a few days ago, having been unable to stand the malarial climate of the Isthmus. He said that the company had only money enough on hand to continue work for four months. The death rate among the laboring men had averaged 60 per cent. Of 72 Frenchmen who went to the Isthmus from France one year ago, but 11 remain to-day. Forty-five died in that period, and six left on account of sickness. Mr. Boulange intends to remain in the United States.

Preserving Dead Bodies.

The *Daily News* Paris correspondent telegraphs: The following discovery by Dr. Bouchard, of Bordeaux, for preserving dead bodies is important to medical students and artists engaged in anatomical studies. According to a paper read recently in the Academy of Medicine, the tissues of corpses prepared after this method remain unaltered for upward of two months. The ingredients are 20 pounds of hydrated sodium borate, containing ten equivalents of water, and 34 pounds of glycerine at 30° Reaumur. The borate is reduced to fine powder and shaken through a hair sieve. The glycerine is added little by little, in such a manner as not to make lumps. The mixture is then brought up to a temperature of 80° C. (176° F.), being meanwhile well stirred to dissolve the borate. The solution is finally allowed to drip through a woolen cloth. It is of the consistency of glycerine, but can be made of the required thinness by addition of alcohol. It is injected in the carotid or the femoral artery.

DUTCH BELTED CATTLE.

We present a portrait of an excellent representative of a unique and novel breed of dairy cattle. They are natives of Holland, and antedate the seventeenth century, when the cattle interests in Holland were in the most thrifty condition, and this type and color were established by scientific breeding—admitted to be the highest attainment ever reached in the science of breeding cattle. The historian Motley well said: "These are the most wonderful cattle of the world."

In their native country they are owned and controlled by the nobility, and present a very novel feature in the landscape, grazing in the low lands in Holland. In color they are black, with a continuous white belt around their body, the white being pure white, the black jet, making a beautiful and imposing contrast. Their form is usually very fine, and they are wonderfully productive as milkers. Lady Aldine (124), illustrated herewith, is the property of H. B. Richards, Avona Farm, Easton, Pa. She stands at the head of the noted Aldine family, which have become famous as prize winners. Three of this family—Harry Aldine (51), Minnie Aldine (126), Jennie Aldine (180)—have recently been purchased by a gentleman in Orange, N. J., with the view of introducing the stock into eastern New Jersey, where it is but little known.

DUTCH BELTED LADY ALDINE.

FLYING FOXES.

(PTEROPUS EDWARDSI, P. MEDIUS, P. LEUCOCEPHALUS.)

Among the many anomalies presented by nature, that of a flying mammal has seemed strikingly incongruous, and has always left an impression on the popular mind generally the reverse of the truth. The fox bats are an example in point. Superstition has gathered about these strange creatures the wildest fears, and their uncouth and weird looks has strengthened a foolish credence in the stories of vampire and devil. They it was who settled at night upon the wearied sleeper and sucked his life blood, or with a malicious bite involved the souls of the virtuous in the terrors of their own lost estate.

The calm examinations of the naturalist long ago put to flight these romantic tales, but in their haunts, among the woods of Southern Asia, in Africa, Australia, Java, Sumatra, their black swarms and flying movements yet awaken dread and disgust. The flying foxes are ranged under the order of the Cheiroptera, or *hand-winged* mammals, and are grouped together in the sub-section of the fruit-eating bats, as distinguished from those feeding mostly upon insects.

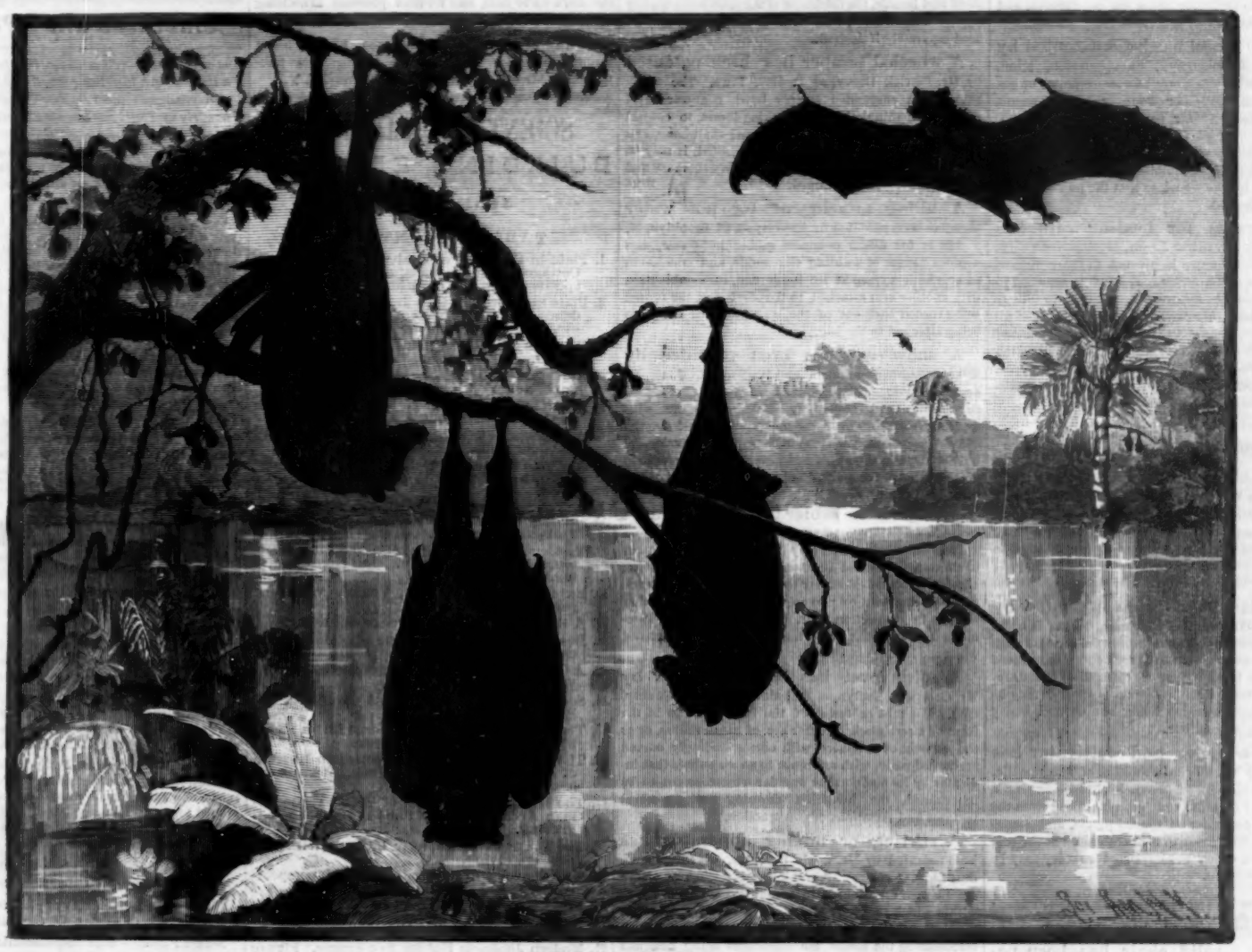
Their depredations upon orchards and vineyards are notorious. Sailing through the air at sundown, and guided by an acute sense of smell, they will enter the plantations containing some plant upon which the fruit has reached maturity, and covering it in crowds, will revel in the delicious repast, leaving the tree or vine at dawn stripped of all its precious wealth. They fly rapidly, but never at any great height, and sometimes will traverse considerable spaces, migrating from island to island over intervening arms of the ocean. On the ground they are agile and curiously active. They climb trees with ease, and during the day hang by their hind limbs, their wing membrane wrapped around them, from the loftier boughs. So densely are they sometimes congregated that the tree seems a solid mass of black, motionless bags.

The species shown in our woodcut is distributed over East India, and finds also a favorable habitat in Madagascar. It lives in immense colonies, and its swarms have been compared to those of gnats, while the branches they infest sometimes break down with their great weight. They feed on dates, bananas, the guava fruit, and also eat insects, the young and eggs of birds, and apparently at times snakes. Their flesh is edible, and esteemed immensely by natives, who catch them in nets in the trees and kill them on the ground.

In flight, they can be brought down by a blow delivered on the expanded arms, covered with the flying membrane (patagium), as these are very weak. This species is seen more frequently in captivity than any other, and Brehm, from whose admirable Thierleben these notes are taken, speaks with characteristic enthusiasm of his observations made upon one. The "fox" slept nearly all day, though regularly he devoted some time to the cleansing and preparation of his "flying machine," and occasionally bestirred himself for the enjoyment of a cherry or a sip of milk. At the approach of night he became restless and excited, stretched his wings, and vainly attempted to escape. He displayed temper, and would bite sharply any one whose familiarities he resented. The combats of these animals with one another are very relentless, and generally terminate with the death of one or both contestants.

The head in these bats is long and pointed, the ears moderately large, the nose without the appendages seen in the insectivorous bats, and the jaws armed with incisors, canines, and molar teeth.

They form in their habitat interesting spectacles, and their whirring progress through the air at night or the pendent throngs they present by day alike astonish the visitor to Ceylon and India. The bats are naturally regarded as one of the most distinctly marked groups of animals, and among them the flying foxes (*Pteropida*) are easily identified. They have long been known in literature, and the ancient Herodotus speaks of them in Arabia, and says the inhabitants protected themselves against them in dresses of leather. Later classic authors allude to them, and many naturalists have in the East carefully observed their habits.



FLYING FOXES.

Hurry and Dispatch.

Among the many causes of poor and inefficient work is the habit of hurry, which takes possession of some busy people. Having or imagining they have more to do in a given time than can be done properly, they grow confused, agitated, and nervous; and, under this pressure, they proceed with the work in hand without requisite deliberation and care, perhaps omitting parts of it—sometimes important parts—and producing at last an imperfect and inferior performance, which can neither be permanent nor satisfactory.

There is hardly any employment, from the simplest manual work to the most complex and difficult mental labor, that does not suffer from this cause. The dwelling house in process of building is to be finished at a certain time. With proper forethought and system it would have been done, but the time approaches and the work is still incomplete. The future occupants are impatient, the contractor is anxious, the workmen are driven, the work is hurried through, and annoyance, discomfort, and sometimes danger ensue, and repairs are soon found necessary. The business man undertakes more than he can manage, the days are not long enough for his needs, he is agitated by the constant pressure, driven by conflicting claims, his business suffers for the want of a clear and cool head, his health suffers from continual and unrelaxed exertion, his family suffers from his deterioration, and general disaster ensues. The physician, with many other calls to make, hurries through the visit, neglecting some important symptom, and his patient dies; the lawyer hurries through his plea, and loses his case; the preacher hurries through the preparation of his sermon, and fails to make an impression; the artist hurries on his picture to completion, and his best conception is not there; the teacher hurries through a prescribed course of instruction, and the class is left destitute of the more important elements of knowledge. It is not too much to say that a large proportion of the unhappiness, the ignorance, the loss of property, and even the loss of life, that is endured in the world is to be directly traced to the hurry and drive which characterize so much of the labor performed.

Many persons not only drift into these hurried ways, but pride themselves upon them. They boast of their speed, and contrast it with the slower measures of their more deliberate neighbors. They flatter themselves upon their dispatch, and hold themselves of more value on that account. Slowness in work, lingering or loitering over what is to be done, is not to be recommended. On the contrary, energy and vigor will prompt the healthy and industrious man to labor steadily and rapidly, while neglecting nothing that is needed to perfect his work. But this is very different from the agitated and excited hurry which has been mentioned, and which is to be deprecated. —*Philadelphia Ledger.*

Enlargement of Sibley College, Cornell University.

During the past two years the growth of Sibley College, Ithaca, N. Y., has been unexpectedly large. The number of students in attendance has taxed the resources of the buildings to the utmost. The number registered has approached closely the maximum for which accommodations were provided. A new building has accordingly been commenced, and is now in progress. It is to be presented, when completed, to the university by its great benefactor, the Hon. Hiram Sibley. This will provide for fifty per cent more students, so that one hundred men will now be admitted to the freshmen class, a total of three hundred being provided for. The entrance examinations will maintain their high standard, and, to a certain extent, will operate to keep the number admitted to the courses for degrees within limits. The Sibley College is devoted to engineering, and its success is largely due to the energy and ability of its director, Dr. Robert H. Thurston. His standing in the profession has guaranteed a good engineering course, and his executive abilities and originality have found congenial scope in Cornell University.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Abraham G. W. Foster, of Newman, Ga. This invention covers novel features of construction and the combination of parts whereby the coupling may be effected from the sides of the car, and the link may, from the same point and with the same lever, be adjusted to enter an opposing coupler of greater height.

A car coupling has been patented by Mr. David L. Voss, of Spokane Falls, Washington Ter. This invention provides a device wherein the coupling block may be set for automatic coupling with the link, and in which the uncoupling may be effected from the top of the car, the device being easily adaptable for coupling with cars having ordinary pin and link coupling.

A snow plow has been patented by Mr. Oliver U. Goinaud, of Excelsior Springs, Mo. It is for removing snow from railroad tracks by loading from the drift upon the plow and removing to a convenient place for dumping, and has a plow movably mounted on an inclined platform, with segmental guides on each side carrying a swinging end gate or cutter.

A stock car has been patented by Mr. John Westfall, of Lawrence, Kansas. It has a tank in its top, arranged transversely at the ends and with funnel-shaped inlet pipe, spray pipes with suitable valves, hay racks hinged on the side of the car at the bottom, pivoted and tilting troughs, partition gates, and other novel features, to facilitate the more comfortable and humane transportation of cattle.

A reaction wheel has been patented by Mr. Hippolyte J. Seigneuret, of Henderson, Minn. This invention relates to a novel form of motor or gas engine, providing a novel construction of wheel, means for combining gas and air to produce an explosion, means for vaporizing oil from which the gas is made, and means for relighting the exploding jet if it should be extinguished, the force obtained operating upon and in connection with the wheel, so that the power may be transmitted as desired.

An apparatus for heating cars has been patented by Mr. Oliver Bryan, of New York City. A counterbalanced damper is pivoted in the mouth of the smoke stack, and a section of pipe is attached to the stack extending rearwardly, flexible couplings forming extensions therefrom by which a series of direct horizontal pipes are obtained through the length of a train, through which the products of combustion ordinarily escaping from the smoke stack will be passed, subject to the regulation of the damper, and be discharged from the rear of the last car.

AGRICULTURAL INVENTIONS.

A cotton chopper has been patented by Mr. Heinrich W. Sacks, of Round Top, Texas. It is for chopping growing plants to a stand, and has a hoe which may be operated either by hand or foot power to give lateral motion as the machine is drawn along, to chop the plants to a stand at any desired distance apart, while the entire machine is light and strong.

A seed planter has been patented by Mr. Roemer Johnson, of Tacaleeche, Miss. It has a wheel running upon the ground which imparts through pitmen a reciprocating motion to feed slides in the seed box, these slides being adjustable to regulate the dropping of seed at such different distances apart as may be desired, the whole machine being simple and easily kept in repair by any farmer.

A cotton chopper and cultivator has been patented by Mr. Edward Franklin, of Thomasville, Ga. It is a machine to be driven by hand, carrying a circular chopper or knife which can be raised from the ground to save particular or special plants, and standards carrying cultivator shovels are mounted at the rear of the machine, which are arranged so they may be used or not, as desired.

MISCELLANEOUS INVENTIONS.

A folding invalid chair has been patented by Mary A. Hendricks, of Charleston, S. C. It is designed for use as a commode or as an upright reclining chair, or both at pleasure, and when not in use may be folded in small compass for transportation or storage, while it is simple in construction and durable.

A school desk has been patented by Mr. John M. Abbott, of Silver Plume, Col. In this desk the writing leaf, or desk proper, can be folded back out of the way, a receptacle being arranged for the scholar's books at one side of the seat, and a novel form of ink well being provided for in connection with the folding leaf.

An ironing table has been patented by Mr. Lafayette D. Rose, of South Carrollton, Ky. It is so made that it can be quickly and compactly folded and will be firmly supported when in use, while the bosom and sleeve boards are made easily detachable and interchangeable, and capable of secure attachment to the ironing table.

A revolving soap holder has been patented by Messrs. Herbert M. Avers and John M. Pease, of Chicago, Ill. It consists of a revoluble soap cage, in connection with a handle and shaft giving a double rotation to thoroughly and evenly distribute the soap in making soapy water or suds, without slopping over the water.

An ornamental veneer has been patented by Mr. William H. Hoyt, of Stamford, Conn. This invention relates to the utilization of the pith of cornstalks and similar material for ornamental and useful purposes, the veneer being made by forming a layer of such substances upon a suitable backing or stiffening, for surfacing picture frames, walls, panels, etc.

A shutter for photographic cameras has been patented by Mr. John J. Higgins, of New York City. It has a circularly adjustable open-faced cap or ring, combined with an apertured rotary shutter, with a spring catch, a handle or bearing, a tube and its apertured diaphragm, and a spring with graduated scale to regulate the speed of the throw of the shutter.

A tricycle has been patented by Mr. James Bate, of Newark, N. J. It is to more conveniently arrange the driving and steering mechanism of such devices as are used by children, providing for the driving of the tricycle from a saddle or seat, so that the rider may use his weight as the chief motive power, and the steering will be conveniently effected.

A roofing cement has been patented by Mr. Henry Frei, of Kansas, Ill. It consists of three parts of white or red lead pigment, with one part of plaster of Paris, and sufficient oil to form a plastic mass, making, when prepared as specified, a cement that is proof against cracking in the frosts of winter or heat of summer, while being waterproof and durable.

A furniture pad has been patented by Mr. E. Lanson Dunkle, of Wyalusing, Pa. It is made with a flexible metallic frame having a central opening, with teeth or spurs at the margin of the opening, and a cushion held at the opening by the teeth, it being designed for attachment to the backs of furniture frames to prevent damage from anything liable to strike the furniture.

A ruling pen has been patented by Mr. Christian A. F. Oriob, of Salt Lake City, Utah Ter. It is especially designed for ruling a double and a single line simultaneously, and consists of two ruling pens, one double and one single, in combination with a cross piece and handle, the thickness of the lines being readily regulated and varied, while either of the pens may be used separately if desired.

A wheeled scraper has been patented by Mr. Patrick Deevy, of Dudley, Iowa. The crank axle has a suspended scraper bowl, connected with which are manipulating and locking levers, to control the height and angle at which the bowl shall hang, and devices whereby, when the bowl is filled, it may be properly held to hold its contents to carry them off and then be conveniently dumped.

A filling attachment for hot water bags has been patented by Kate Ryan, of Brooklyn, N. Y. It is for filling common rubber hot water bags without danger of scalding the hands, and consists in an arm with a clasp at its lower end, in combination with another arm attached to the first one, the funnel being turned back out of the way when the device is being attached to the bag.

A show case has been patented by Messrs. Samuel Steinfield and William R. Foust, of Leetonia, Ohio. It has inclined sides and a series of compartments for containing shirts, collars, etc., with a sliding sash for the glass and sliding shelf for the convenience of the salesman in handling the goods, and notched bars in the upper and lower part of the case to receive a board for holding shirts up to the front of the case.

An extension ladder has been patented by Mr. George Albee, of Susquehanna, Pa. The ladder sections are similar, and may be slid upon each other to shorten or extend the ladder, the sections having clips on opposite sides near their ends, the clips of each section being bent over to engage side bars on the other section, in connection with hooks and pins for automatic fastening, but which may be readily unfastened when the ladder is to be shortened.

A spirit level has been patented by Mr. George P. Evelyn, of Pall Mall, Middlesex County, Eng. The tube or vessel of the level is made in the form of a semicircle or other arc of small radius, or as the segment of a sphere, with correspondingly curved graduated scale, with reference to an air bubble that indicates by its position the angular measurement to be ascertained, the invention covering various novel features and variations of construction.

A stirring or mixing apparatus has been patented by Mr. Louis Stauffert, of Dinglingen, near Lahr, Germany. A crank arm and wings or blades are pivoted on a shaft, in combination with a sleeve within which the shaft slides, links being pivoted on the sleeve and on the blades, and a cone-shaped shell surrounding the sleeve, the apparatus being designed for stirring and mixing the contents of barrels stored in cellars and other places.

NEW BOOKS AND PUBLICATIONS.

A PRACTICAL TREATISE ON PETROLEUM; COMPRISING ITS ORIGIN, GEOLOGY, GEOGRAPHICAL DISTRIBUTION, HISTORY, CHEMISTRY, MINING, TECHNOLOGY, USES, AND TRANSPORTATION. Together with a Description of Gas Wells, the Application of Gas as Fuel, etc. By Benjamin J. Crew. With an Appendix on the Product and Exhaustion of the Oil Regions and the Geology of Natural Gas in Pennsylvania and New York. By Charles A. Ashburner, M.S., C.E., Geologist in Charge Pennsylvania Survey, Philadelphia. Illustrated by 78 engravings and two plates. 8vo, pp. 508. Philadelphia: Henry Carey Baird & Co. Price, $4.50.

As its very ample title page indicates, this treatise covers the whole subject of petroleum, dealing with every phase of the industry, and is very thoroughly and well illustrated. Such a treatise has long been wanted, and this one, we are glad to know, has already met with substantial success, having found a good market, not only in this country and in England, but on the Continent of Europe and Asia. Although the book labored under the disadvantage of the death of the author shortly before it was put to press, it has been brought before the public in a most creditable manner. An English writer who has devoted much attention to the subject of petroleum, in a private letter says: "I looked through the book, before reading the preface, and had made up my mind to write and congratulate Mr. Crew upon the success I considered he had achieved, when to my regret I found in the prefatory pages that he was dead. This is indeed very melancholy. Few authors of such solid books ever receive their due meed of praise, even if they survive them a lifetime, but to die without knowing the fate of one's labors is a hard and distressing lot." The papers contributed by Mr. Ashburner, of the Geological Survey of Pennsylvania, on the Oil Regions and Geology of Natural Gas, are a substantial addition to the value of this treatise, and give it a completeness which it otherwise would lack. The volume is supplied with an admirable index, making every important item within the book easy of reference.

THE CIVIL ENGINEER'S POCKET BOOK. By John C. Trautwine, C.E., revised by John C. Trautwine, Jr., C.E. New York: John Wiley's Sons. 1887. Pp. 866.

The eleventh edition and twenty-seventh thousand of this classic pocket book has just been received. It is so well known that no review is needed, except to note changes. In a series of prefaces the successive additions and emendations to the various editions are set forth. In the present revised edition, formulæ for thicknesses of cylinders under internal pressure, and new and fuller tables of the values of foreign coins, may be noted. Mr. Pegram's suggested uniform loading for railroad bridges to be substituted for the usual wheel loads in specifications is inserted. Other changes, such as the addition to the table of locomotive weights of some of the newer and heavier ones, are noted. The author and reviser have shown every desire to keep the work up to date, and we take pleasure in noticing their success.

* * Any of the above books may be purchased through this office. Send for new catalogue just published. Address Munn & Co., 361 Broadway, N. Y.

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) **D. R. P. writes:** I have a valuable rifle and revolver which I desire to keep in good order. What oils shall I use? A. Sperm oil that has been exposed to the sun for a week, in a bottle, with lead shavings, makes a very fine oil, much used for sewing machines, clocks, and watches.

(2) **C. P. C. desires a receipt of wine** color lacquer, such as is used upon tinware, etc. A. Put 3 ounces of seed lac and 2 drachms aniline, color of shade to suit, into a pint of well rectified spirits. Let the whole remain for 14 days, but during that time agitate the bottle once a day at least. When properly combined, strain the liquid through muslin.

(3) **L. B. asks the latest processes on** mixing and preparing the material with which to manufacture paper buckets. A. Ordinary wood pulp is used mixed with glue or size, pressed into moulds and varnished.

(4) **J. G. writes:** 1. The English unit of heat being the quantity required to raise one pound of water one degree Fah., what is the measure of a unit of heat as applied in measuring change of temperature of air? A. The amount of heat which would raise one pound of water any given number of degrees would raise about one-quarter of a pound (more accurately 0·2374 pound) of air the same number. A cubic foot of air weighs 536·96 grains. A given weight of ice in melting would absorb enough heat to lower the temperature of an equal weight of water 142° Fah., or 79° C. On these factors ordinary calculations as to refrigerators can be based. Thus a pound of ice in melting would have capacity to lower the temperature of a pound of air (volume 13 cubic feet) 624° Fah. $\left(\frac{142°}{0·2374}\right)$ or to lower the temperature of 624×13 cubic feet 1° Fah. Taking 94° as the temperature of the air, the melting of a pound of ice would absorb enough heat to lower 130 cubic feet to 32° Fah. This does not take into account the additional heat absorbed in the melting of the ice nor the inevitable waste in its application. If the refrigerator is ventilated, this feature would also involve a loss in economy. 2. What chemical effect has aqua ammonia on the materials used in clothing, especially underclothing? A. If not too strong, it has a cleansing action without injuriously affecting the material. 3. What effect has aqua ammonia if taken into the human stomach? A. It acts as a strongly corrosive and fatal poison if concentrated. If very dilute, it counteracts acidity, is a stimulant, and is a good cure for sick headaches. 4. What will take out the "fire" (so called) of aqua ammonia, so that in its use for cleansing it will not make the hands feel rough? A. Mix oleic acid with it. 5. What produces the cloudy appearance of some of the ammonia compounds sold by grocers for washing fluid, etc.? A. The different washing ammonias vary in composition. Oleic acid is contained in one prominent brand, and accounts for the milky appearance. 6. What is the best combination with aqua ammonia for general family use in washing and general cleaning purposes? A. Oleic acid is very good. Such a combination is patented. 7. Can you give a formula for family washing compound and state effects on underclothing and hands resulting from frequent use and give the cause of the effects? A. Dissolve 1 pound hard soap in 6 gallons of water, then add ¼ ounce spirits of turpentine and ¼ ounce spirits of ammonia. Such soaps are stronger than the ordinary varieties, and contain a large amount of alkali, which tends to rot the clothes. See a book on soap making, etc., by Watts, which we mail for $3.

(5) **S. U. P. asks if the burning of** bones renders them less valuable as a fertilizer. A. It does impair their value. 2. How to make silhouettes, with the aid of a good magic lantern. A. Locate the lantern three feet from a hard wall, seat the subject in a chair one foot from the wall; place a sheet of white paper against the wall, securing the four corners with flour paste, then with a pencil trace out the outline of the figure as projected by the lantern. If the paper is cut out on the lines sketched, a silhouette will be made. Black paper may be pasted on to the white sheet before cutting, if it is desired to produce a black silhouette.

(6) **M. L. S. asks:** 1. How great is the distance at which the telephone in its present state of perfection can be worked with good results? A. There is so much difficulty in working long lines that no general answer can be made. Although Chicago has been in telephonic communication with New York, and Boston intermittently, and Philadelphia with rather more success, we think the telegraph is more used for distances exceeding twenty-five miles. 2. To what is this limitation of distance due? Is it owing to the current being enfeebled by induction, or does the simple fact of the distance enfeeble it? A. It is owing to electrostatic capacity of the line. 3. When an iron is white hot and is then allowed to cool, does it pass through all the colors of the solar spectrum? If not, what colors and in what order does it pass through? Can the same thing be produced by chemical heat? A. Iron or steel cooling from a white heat has its surface oxidized, and only shows the gradations of temperature ranging through the yellow and red series to the black, and does not represent the prismatic spectrum. Its light is incandescent. In heating a piece of polished iron or steel, the order is reversed below 700°, and commences with the pale straw, deepening into orange and reddish brown to violet and blue, ending in black, when, if the heat continues to rise, it runs back through the red and yellow series to white. The lower heat series of colors is due to the reflection of light from the surface altered by oxidation. The oxidized surface color is permanent if properly preserved. There are chemical means of producing colors on the surface of steel, iron, and other metals by their proper degree of oxidation or the deposit of other oxides or metals.

(7) **G. B. asks (1) whether common salt** (NaCl) dissolved in water, and decomposed with electricity, will yield (HCl) hydrochloric acid? A. With a current of sufficient electromotive force, chlorine gas will be given off at one pole and hydrogen at the other. The electrodes must be of carbon or some material not attacked by chlorine. Otherwise only a portion or none will escape, as the electrode will be dissolved. The fluid should also be warm, as chlorine dissolves in cold water. 2. How could Cl be extracted from NaCl? A. By warming with sulphuric acid and manganese dioxide.

(8) **H. S. asks:** 1. Which of three midship sections of equal depth and beam will have the greatest initial stability—one with the extreme beam on the rail, on the deck, or on the water line? A. On the water line. 2. What, if any, is the advantage of building yachts with the falling-in top sides of a man of war? A. Because this form gives better lines when sailing on their beam.

(9) **J. T. D. asks the best soldering solution** for soldering copper wires to German silver springs, so that, after being soldered a few weeks, the springs will not be covered with verdigris. A. Use silver solder with borax flux.

(10) **Machinist.—You should put nothing** on leather belts to prevent their slipping. Cover the pulleys with leather.

(11) **M. A. M. asks** (1) the composition of perspiration. A. In 1,000 parts perspiration there are of:

Water	995·50	parts.
Sodium chloride	2·25	"
Potassium chloride	0·24	"
Sodium and potassium sulphate	0 01	"
Sodium and potassium united to organic acids	2·00	"
	1,000	"

2. If used in quantity sufficient for the exciting fluid of a common battery cell where zinc and copper are used, what parts of the fluid would have an affinity for the metals, and what changes would take place in the fluid or its parts? A. The water would suffer decomposition.

(12) **G. F. R., Hawaii, asks** (1) whether the use of crude petroleum as fuel for boilers is injurious to boilers, either directly or indirectly. If so, in what way? I have been using it with bagasse in the furnaces of a sugar factory. A. The use of petroleum in boiler furnaces is gradually increasing in the United States, it being principally used in connection with a steam jet. The manner of its use you will find in SCIENTIFIC AMERICAN SUPPLEMENT, No. 6, also in a book, "Petroleum Fuel," by Ross, which we can furnish for $1.50. Petroleum as fuel is not injurious to iron or the boilers. 2. Whether Stockholm tar possesses any acid or other properties in its component parts which may be injurious to iron, if used on bearings in proportion of one part to three with coal tar? A. "Stockholm tar," as also other wood tars, contains a very small percentage of pyroligneous acid and creosote. But the tar would not be injurious to iron in the manner of your use mixed with coal tar for heavy bearings.

(13) **W. O. C. says:** Will you please tell me how many pounds of water a cubic foot of dry granite will absorb? A. A correspondent, to whom we submitted the above inquiry, made a practical experiment, concerning which he writes as follows: We inserted a cubic foot of granite into a barrel of water, placing same on four small blocks, so that the six sides of the cube would be exposed to the water. And after the granite was in the water thirty-six hours, it was again weighed, and we find only about 1 ounce difference in the weight, and as the granite was weighed while it was wet, we calculate it was the water on outer surface that made this 1 ounce difference.

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Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Proposals for Steel Gun Forgings for the Navy.

NAVY DEPARTMENT,
WASHINGTON, *June 4, 1887.*

Sealed proposals from domestic manufacturers of steel, to furnish ten sets of steel forgings for 6-inch B. L. rifle guns and one set of chase—hoops for a 10-inch B. L. rifle gun, all oil-tempered, annealed, and in accordance with drawings and specifications prepared in the Bureau of Ordnance, will be received at the Navy Department until Wednesday, the 6th day of July, 1887, at 12 o'clock noon, at which time the proposals will be opened.

The kinds of forgings required and the estimated quantity of each, the aggregate being about sixty-five tons, are stated in blank forms of proposal, which together with copies of said drawings and specifications, may be obtained on application to the Bureau of Ordnance, Navy Department.

Prices per ton of 2,240 pounds must be stated in the proposals, which must be made on forms furnished by the Department. Proposals will include, in addition to items embracing all the work required in the manufacture of the forgings as specified, separate items for *tubes, jackets,* and *trunnion bands,* to be rough-bored and turned by the Department. In case the Department shall find it advantageous to have that part of the work done at the Navy Yard, Washington, D. C., such forgings will be delivered by the contractor before roughing, the Department paying freight to and from the Navy Yard, and the rough-bored and turned forgings will be returned to the contractor, F. O. B. at his works.

The contract will be awarded for the forgings as a whole. No proposal for less than the whole will be entertained; nor will any proposal be considered unless accompanied by satisfactory evidence that the bidder is in possession of a plant adequate to the production and delivery of the required forgings. All forgings delivered under the contract must conform in material, manufacture, and quality to the aforesaid drawings and specifications, and must successfully pass the required inspection and tests.

The successful bidder will be required, within ten days after notice of award, to enter into a formal contract binding himself to deliver one set of gun forgings within sixty days from the date of the contract, and not less than one set every twenty-one days thereafter, and to complete the deliveries within nine months from the date of the contract. A bond with sufficient sureties in a penal sum equal to fifteen per cent of the total contract price must accompany the contract.

Blank forms of contract and all additional information desired can be obtained on application to the Bureau of Ordnance, Navy Department.

Each proposal must be accompanied by a certified check, payable to the order of the Secretary of the Navy, in an amount not less than five per cent of the total amount of the bid. Checks of unsuccessful bidders will be returned within five days after the bids are opened. The check of the successful bidder will be returned when he shall have executed the formal contract and furnished the requisite bond; in case of his failure to comply with this stipulation, the check will become the property of the United States.

All proposals must be in duplicate, enclosed in envelopes marked "Proposal for Steel Gun Forgings," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The right is reserved to waive defects in form and to reject any or all bids.

WILLIAM C. WHITNEY,
Secretary of the Navy.

Proposals for Iron Floating Gate or Caisson.

NAVY DEPARTMENT,
BUREAU OF YARDS AND DOCKS,
WASHINGTON, D. C., June 7, 1887.

Sealed proposals, addressed to the Chief of the Bureau of Yards and Docks, Navy Department, Washington, D. C., indorsed "Proposals for Floating Gate," will be received at this bureau by the undersigned until one o'clock p. m. of Thursday, the thirtieth day of June, 1887, at which time and place the proposals will be opened in the presence of bidders for furnishing the necessary labor and material for the construction of an iron floating gate, or caisson, for the dry dock at the Navy Yard, Boston, Mass.

Plans of the floating gate, or caisson, and all attachments pertaining thereto, can be seen and copies of specifications and instruction to bidders obtained by applying to the Bureau of Yards and Docks, Navy Department, the Civil Engineer's office at the Navy Yard, Boston, Mass., or at Navy Pay Office, cor. Broadway and Chambers Street, Stewart Building, New York city.

The bureau reserves the right to reject any or all bids that may not be deemed advantageous to the government. No proposal will be considered unless accompanied by the prescribed bond which forms a part of the same.

D. B. HARMONY,
Chief of Bureau.

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